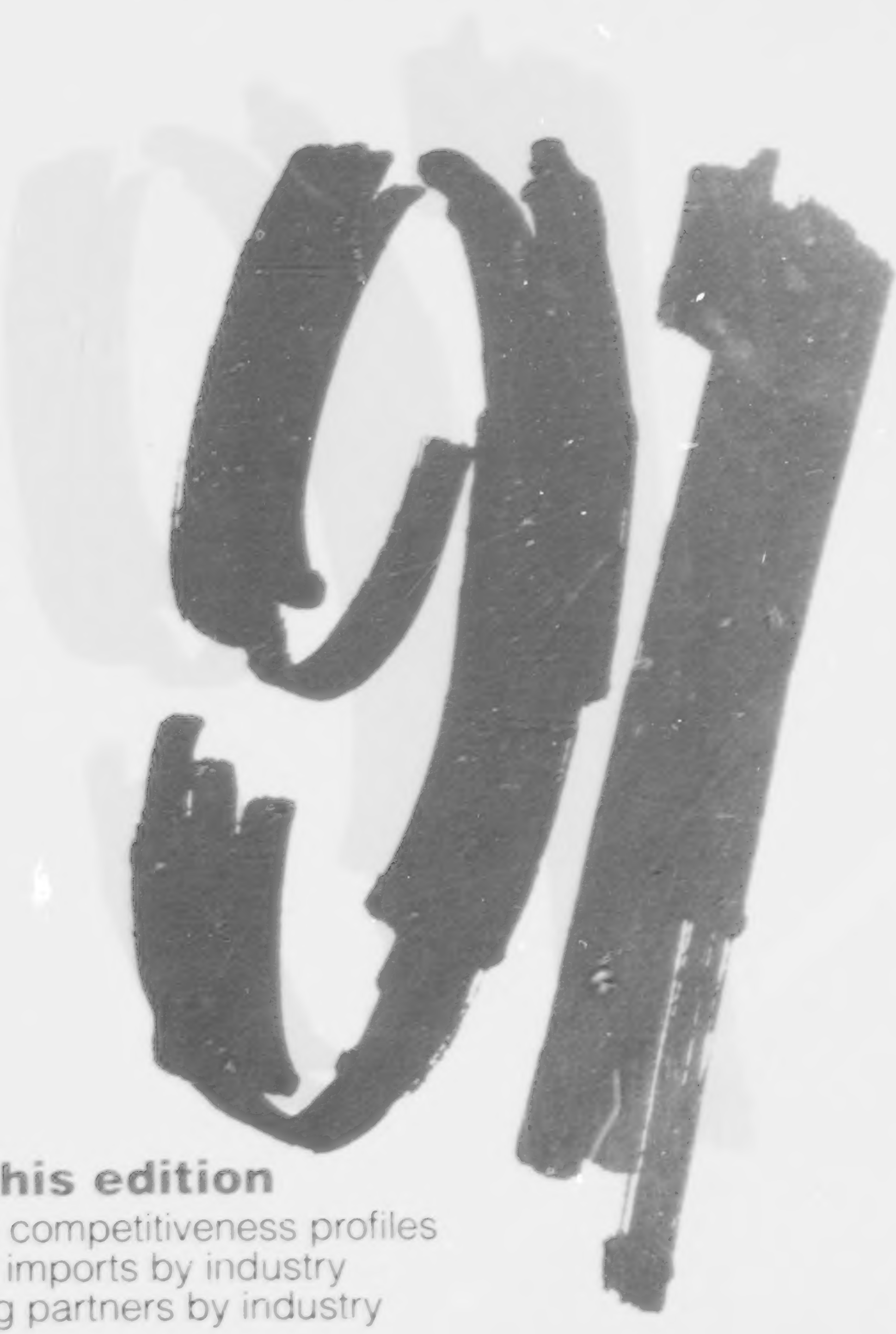
991

U.S. INDUSTRIAL OUTLOOK

Prospects for 350 industries with 450 tables and charts



New in this edition

International competitiveness profiles
Exports and imports by industry
Major trading partners by industry

U.S. DEPARTMENT OF COMMERCE / International Trade Administration

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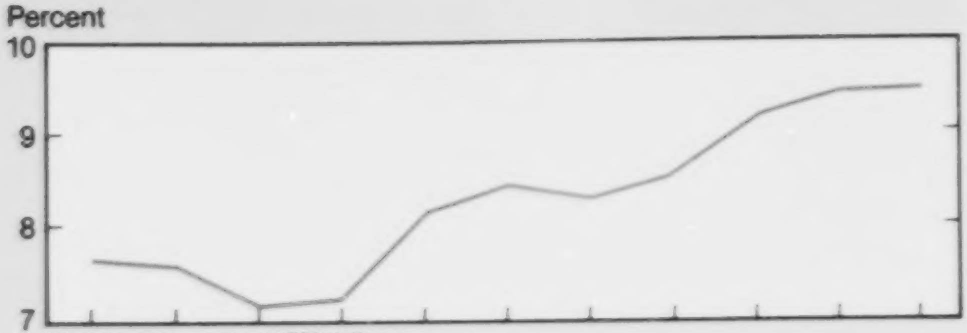
READEX

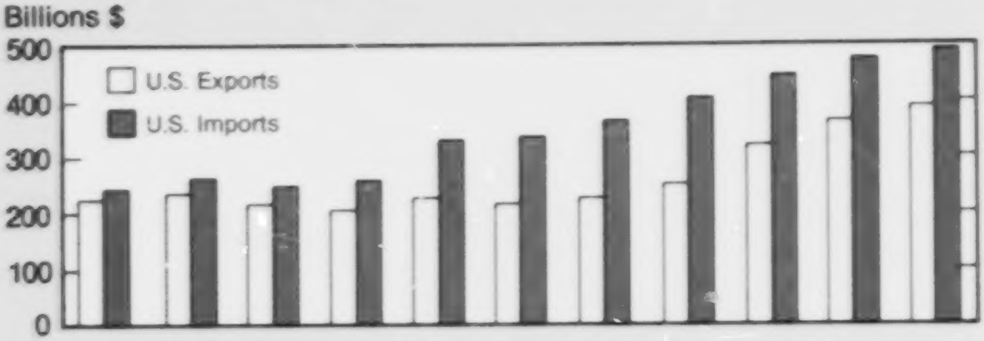
ECONOMIC TRENDS 1980-90

INVESTMENT IN PRODUCERS' DURABLE EQUIPMENT AS A PERCENT OF GNP*

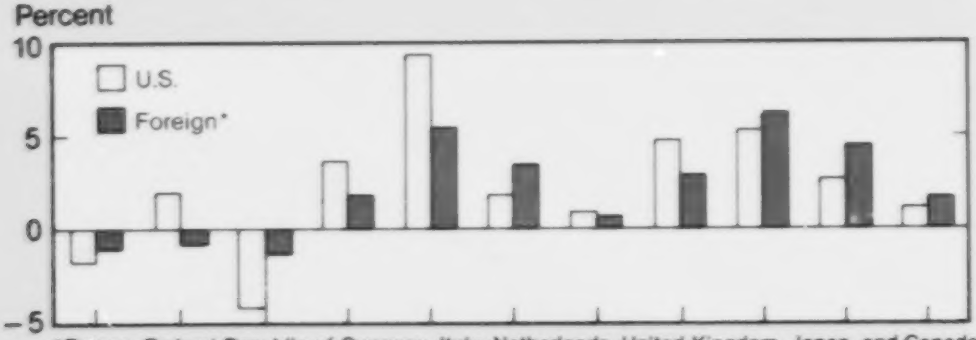


*Measured in constant 1982 dollars.

U.S. MERCHANDISE EXPORTS AND IMPORTS

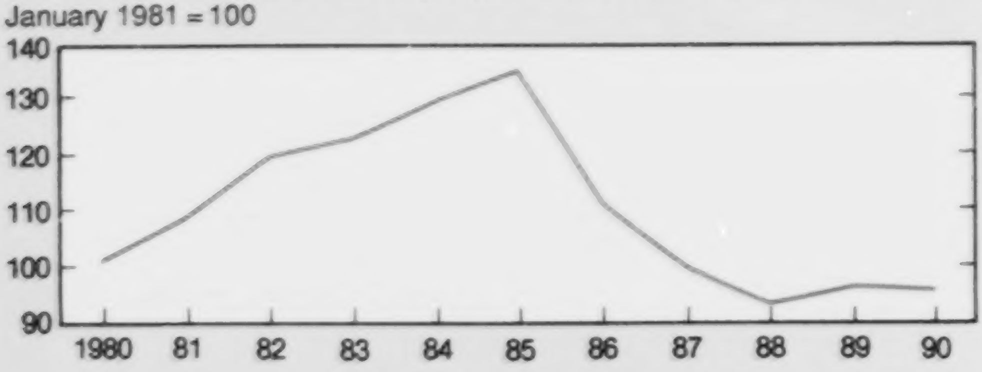


CHANGES IN U.S. AND FOREIGN INDUSTRIAL PRODUCTION



*France, Federal Republic of Germany, Italy, Netherlands, United Kingdom, Japan, and Canada.

VALUE OF THE U.S. DOLLAR*



*Multilateral trade-weighted exchange rate with 10 countries.

Note: 1990 data year to date, as available.

Sources: U.S. Department of Commerce; Board of Governors of the Federal Reserve System; International Monetary Fund.

1991
U.S. INDUSTRIAL OUTLOOK

Prospects for 350 industries with 450 tables and charts

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January 1991

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Message from the Secretary

In the fast-changing world of the 1990s, economic and commercial relationships among countries become more important. Entering a new era in our relations with so many trading partners, such as the Soviet Union and the countries of Eastern Europe and Latin America, means that our strength as a nation will be measured increasingly in terms of our ability to compete in the world. The steps we take to sustain and improve our competitiveness will also bring rewards in terms of our living standards and a more secure future.

President Bush is committed to strengthening our competitiveness. Comprehensive information about U.S. industry and our competitors abroad helps the business community and government to make better and more informed decisions on matters affecting our competitiveness. We are pleased that the *U.S. Industrial Outlook* has proven over the years to be an important source of information. For the 32nd edition, we have taken steps to make it more useful by adding new sections covering trade and international competitiveness.

Coping with the challenging opportunities provided by the world economic situation is a shared responsibility of business and government. It is our hope the information and forecasts contained in the *1991 U.S. Industrial Outlook* contribute to the success of our efforts.

Robert A. Mosbacher

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How to Get the Most Out of This Book

Most of the information in this edition of the U.S. INDUSTRIAL OUTLOOK is based on the state of the economy in the third quarter of 1990. The date each analysis was written appears at the end of each section, along with the author's name and telephone number. Because the economy grew at a slower rate than expected in 1990, the Government revised its economic forecasts downward in September 1990. The new estimates are incorporated in the analyses. The feature on "Economic Assumptions" helps to establish the economic frame of reference.

Most of the 350 industries covered in the OUTLOOK are defined according to the Standard Industrial Classification (SIC) system. The SIC codes are published by the Office of Management and Budget, and revised periodically to reflect the changing industrial organization of the economy. The SIC system covers the entire field of economic activities in 9 major categories, or divisions: agriculture, forestry, and fishing; mining; construction; manufacturing; transportation and public utilities; wholesale trade; retail trade; finance, insurance, and real estate; and services. These divisions are further segmented into major groups, which have 2-digit SIC codes; then into industry groups, which have 3-digit codes; and finally into industries, which have 4-digit codes.

The most recent SIC in 1987 defines 1,006 industries. The OUTLOOK also covers some service sectors that are not defined according to the SIC system.

New Elements in the OUTLOOK

This edition of the U.S. INDUSTRIAL OUTLOOK introduces profiles of international competitiveness for most industries and includes new tables showing trade forecasts and import-export patterns. The additional references following each chapter have been expanded and include detailed contact information. For readers' convenience, a metric conversion table accompanies this article, along with a glossary of common terms and references used in many of the OUTLOOK chapters.

Cross-referencing at the beginning of chapters permits readers to follow related themes in other chapters. Chapters are structured to provide overviews of relevant economic issues such as trends in product manufacturing, shipments, and consumption; research and development (R&D); international trade or competitiveness (imports, exports, trade barriers, trade agreements); and public policy and social issues (tax policy, product liability, legislation on clean air and water, consumer concerns about chemicals in food, and so on).

Chapters begin with a short near-term forecast—one or two sentences printed in italics—followed by a paragraph describing the industries that the chapter covers. The first major section discusses the domestic market: the rate of change in specific sectors; trends and developments; new product research; and the effects of public policy issues and legislation. In chapters dealing with advanced technology—aerospace, computers, communications, and advanced materials, for example—the authors may discuss ways in which that industry, or segments of it, may depend on the Federal Government, especially the military, for R&D funding and procurement.

Another chapter segment concerns international trade or competitiveness. It may discuss how trade has been affected by exchange rates, trade agreements, and other nations' consumption patterns, as well as joint research or marketing ventures, offshore production, licensing agreements, and trade barriers.

Trade Data

Recent changes in the classification system used to record U.S. trade and a major revision in the data collection process will significantly improve the international comparability and the accuracy of U.S. trade data in the long run. Unfortunately, it makes analysis of changes in U.S. trade activity by industry extremely difficult for 1988-90. For these years, it is impossible to determine if apparent changes in the volume of trade by category are due to actual trade developments or to modified reporting and classification practices.

As of January 1, 1989, U.S. trade activity has been recorded under the Harmonized System (HS), a newly adopted international system for the classification of products in trade. Most of the major industrial countries and many less-developed countries have adopted the HS. Use of the HS should provide more international data comparability, facilitating the alignment of imports and exports by commodity among countries.

A Memorandum of Understanding (MOU) between the United States and Canada regarding the exchange of import data was implemented on January 1, 1990. As of that date, each country replaced its bilateral export statistics with the other's import statistics.

The use of Canadian import data will provide more accurate and detailed information about bilateral trade. A substantial amount of this trade ($15.6 billion U.S. dollars in 1989) has not been recorded on U.S. Shippers Export Declarations. Inclusion of this amount in the aggregate U.S. statistics increased reported U.S. exports for 1989 by 4.7 percent, and increased U.S. exports to Canada by 26.3 percent. Canada also has a lower threshold for reporting data by commodity, which will make more detailed statistics available.

While there are substantial benefits from this procedural change, analysis of data over the transition period will be difficult. A tremendous increase in exports for any trade category where Canadian trade is significant is likely to show up on the data. There is no way, however, to ascertain how much of the change is due to more comprehensive statistics, and to differentiate it from changes caused by other factors, such as the U.S.-Canada Free Trade Agreement and exchange rate fluctuations.

Import and export data are spotlighted in two tables found at the beginning of most chapters covering mining and manufacturing industries. The table entitled "U.S. Exports and Imports, 1989-91" presents trade data for the industries covered in the chapter. The Trade Patterns table presents the aggregate 1989 trade data for selected regions and for the top five trading partners.

The regions are Canada and Mexico; South America (countries on the South American continent only); the European Community (Belgium, Denmark, Germany, France, Greece, Ireland, Italy, Luxembourg, The Netherlands, Portugal, Spain, and the United Kingdom); the newly industrialized countries (NICs) of East Asia that include the Federation of Malaysia, Hong Kong, People's Republic of China, Republic of Korea, Republic of Indonesia, Singapore, Taiwan, and Thailand; Japan; and Other.

International trade data are tabulated following the Census trade concordance as adjusted by the author of the chapter to approximate an SIC industry grouping. Trade data in these tables conform to the following definitions and methodology:

All trade data are reported in current dollars.

Export valuation is on a "free alongside ship" (f.a.s.) basis. This is defined as the transaction price, including inland freight, insurance, and other charges incurred in placing the merchandise alongside the carrier at the U.S. port.

Imports are valued according to the 1982 definition by the U.S. Customs Service; that is, the price actually paid or payable for the merchandise when sold for export to the United States. The value does not include costs incurred in bringing goods to the United States.

Trade ratios do not normally appear in the OUTLOOK because of the difficulties in recasting trade data into the SIC structure and constructing comparable domestic statistics.

Forecasting Methodology

The forecasting process for this edition started in the summer of 1990 when the industry analysts, who write the chapters, received the most recent macroeconomic and industry forecasts from the International Trade Administration of the U.S. Department of Commerce. The analysts combine these projections with information they develop in the course of monitoring their industries throughout the year. Each industry forecast reflects specific economic developments in that industry.

Constant-Dollar Forecasts

The OUTLOOK provides "real" (constant-dollar) forecasts for industry shipments for most manufacturing industries. In most cases, the base year is 1987. Constant-dollar measurements provide a standardized measure of change. Changes in constant-dollar values usually indicate changes in the physical volume of shipments, although they may also indicate changes in quality (with concomitant changes in price), as is the case of the semiconductor industry (SIC 3674). Most important, these measurements provide a basis for comparing activity among industries or within an industry over time, with minimal distortion by price changes.

Statistical Tables

Statistical tables are standard parts of each industry analysis. The "Trends and Forecasts" tables carry 5 years of data, from 1987 to 1991. Data for 1989 and 1990 are estimates, while 1991 data are forecasts. These tables also include four annual rates of change, 1987-88, 1988-89, 1989-90, and 1990-91.

Industry and Product Data

The distinction between industry and product shipments data is sometimes critical to interpreting the statistics in this book Understanding the difference is easier if you first know that shipments data are collected separately for individual factories, or "establishments," and not at the company level. Most plants make a variety of products. For statistical purposes, each establishment is classified in the industry identified with its major product. For instance, the total output of a plant classified as a tire plant may consist of 80 percent tires and 20 percent hose and belting. In this case, the total output of the plant would be credited to the tire industry. Then, the total output of all plants so classified would make up the "industry shipments" of the tire industry.

Other measures of activity under the "industry" heading in the tables (employment, hourly earnings, etc.) are reported on an establishment basis; that is, they relate not only to the primary products (tires) of the establishments in the tire industry, but also to its secondary products (hose and belting produced by the tire plants).

In a second tabulation, the value of all tires shipped by all establishments are added together to show "product shipments." In other words, "industry shipments" refers to the total value of all products shipped by establishments (plants) classified in that industry, plus miscellaneous receipts. "Product shipments" refers to the total value of specific products shipped by all establishments, regardless of how these establishments are classified.

The statistics under "Product" in the tables refer to the total value of a product wherever it is made. Accordingly, the reader should be careful in relating industry statistics (such as employment) to the product statistics. The product mix of each SIC manufacturing industry is published every 5 years in Table 5b of the *Census of Manufactures*.

Deflators and Constant Dollar Measures (1987$)

Deflators are used to compute the constant-dollar value of industry and product shipments; they reflect changes both in the prices and the composition of shipments. (Detailed product shipment information is only available on an annual basis.) Deflators are created by taking a weighted average of price indexes associated with the products produced by an industry; the value of each product shipped that year is the weight. Each year the weights shift in the weighted average to reflect the changing composition of output. The price indexes used are normally taken from the producer price indexes for the net output of selected industries developed by the Bureau of Labor Statistics. Differences between the industry and product deflators are due to the differences between industry and product shipments. The constant-dollar series created using the deflators provides a way to measure changes in volume of shipments over time. Quality improvement is shown in the constant-dollar series as an increase. Even though the physical volume may be unchanged, the "real" amount has increased.

Sources and References

Manufacturing industry data come from the *1987 Census of Manufactures* and advance data from the *1988 Annual Survey of Manufactures*. Data for the nonmanufacturing industries are obtained from a variety of sources, both Government and non-Government. Sources are noted on each table. Industry analysts develop the estimates and forecasts.

Data for manufacturing industries used throughout the book are generally consistent. Consequently, the reader can make cross-industry references to determine, for example, how the performance of a key consuming industry (an industry which uses other manufactured products), such as automobile manufacturing, affects the level of shipments among its suppliers, e.g., the steel and rubber industries.

METRIC CONVERSION TABLE

(approximate conversions to metric measures)

This table is included here to help readers who follow U.S. industry and business competition in world markets. A few chapters in this edition of the OUTLOOK present data about production or consumption in both metric and English measurements—chapters 6 (Wood Products) and 33 (Foods and Beverages), for example. Most chapters, however, report production and consumption only in English measurement. The United States remains one of the few countries in the world still using English measurement.

Symbol	When You Know	Multiply by	To Find	Symbol
		LENGTH		
in	inches	2.5	centimeters	cm
ft	feet	30	centimeters	cm
yd	yards	0.9	meters	m
mi	miles	1.6	kilometers	km
		AREA		
in^2	square inches	6.5	square centimeters	cm^2
ft^2	square feet	0.09	square meters	m^2
yd^2	square yards	0.8	square meters	m^2
mi^2	square miles	2.6	square kilometers	km^2
	acres	0.4	hectares	ha
		MASS (weight)		
oz	ounces	28	grams	g
lb	pounds	0.45	kilograms	kg
	short tons (2000 lb)	0.9	metric ton	t
		VOLUME		
tsp	teaspoons	5	milliliters	mL
Tbsp	tablespoons	15	milliliters	mL
in^3	cubic inches	16	milliliters	mL
fl oz	fluid ounces	30	milliliters	mL
c	cups	0.24	liters	L
pt	pints	0.47	liters	L
qt	quarts	0.96	liters	L
gal	gallons	3.8	liters	L
ft^3	cubic feet	0.03	cubic meters	m^3
yd^3	cubic yards	0.76	cubic meters	m^3
		TEMPERATURE (exact)		
°F	degrees Fahrenheit	5/9 (after subtracting 32)	degrees Celsius	°C

SOURCE: U.S. Department of Commerce, Metric Program Office

Glossary

Anti-dumping duty—imposed by the United States to offset any profits that a foreign firm attempts to make by dumping merchandise on the U.S. market (see dumping).

Apparent consumption—Shipments plus imports, minus exports.

Annual Survey of Manufactures (ASM)—Data drawn by the Census Bureau from a scientifically designed sample of the plants covered in the *Census of Manufactures*.

Caribbean Basin Initiative (CBI)—U.S. program promoting economic development through private sector initiative in Central America and the Caribbean.

CIF—cost, insurance, and freight.

CAD/CAM—computer-aided design and computer-aided manufacturing.

CIM—computer-integrated manufacturing.

Constant dollars (or "real" dollars)—dollar values converted to a base price level, calculated by dividing current dollars by a deflator. Constant dollars eliminate the variation between the year of measurement and the base year.

Countervailing duty—imposed by the United States on imports to offset the advantage a foreign firm may have as a result of subsidies from its own government.

Current dollars—unadjusted dollars; the amount paid in sales transactions.

Dumping—the practice of a foreign firm selling merchandise in the United States at a lower price than it charges for the same merchandise in its own domestic market.

EC92—the merger of the 12 member countries of the European Community into a single market by the end of 1992.

FAS—free alongside ship. The transaction price of an export product, including freight, insurance, and other charges incurred in placing the merchandise alongside the carrier in the U.S. port.

FOB—free on board, i.e., without charge for delivery to and placing on board a carrier at a specified point.

General Agreement on Tariffs and Trade (GATT)—An international code of tariffs and trade rules dedicated to equal treatment for all trading nations, reduction of tariffs by negotiation, and elimination of import quotas.

Harmonized System—An international convention, implemented by the United States in 1989, for classifying imports and exports so that data from different countries are comparable.

Industry shipments—Refers to the total value of products shipped by establishments classified as being in the industry, plus miscellaneous receipts.

NEC—not elsewhere classified.

NIC—newly industrialized country.

Census of Manufactures—Census Bureau reports on specific industries based on industry questionnaires and data from Federal records. Published for years ending in 2 and 7.

OECD—Organization for Economic Cooperation and Development.

Product shipments—the total value of specific products shipped by all establishments, irrespective of the industry classification of these establishments.

Standard Industrial Classification (SIC)—the standard established by the Federal Government for defining industries and classifying individual establishments by industry. The SIC manual is available from the Government Printing Office.

Real dollars—see constant dollars.

Uruguay Round—eighth round of negotiations held under GATT auspices September 1986–December 1990; named for country where initial discussions began.

U.S.-Canada Free Trade Agreement (FTA)—implemented in January 1989 to eliminate all tariffs on U.S. and Canadian goods by January 1998 and reduce or eliminate many non-tariff barriers.

U.S.-Mexico Free-Trade Agreement—proposed by the United States in September 1990; if approved by both countries, would follow the same lines as the U.S.-Canada FTA.

Value-added—the difference between the value of goods produced and the cost of producing them—the wages, interest, rent, and profits added to the output by a firm or industry.

Economic Assumptions Underlying the U.S. INDUSTRIAL OUTLOOK

by J. Antonio Villamil

Chief Economist for the
U.S. Department of Commerce

The 1991 U.S. INDUSTRIAL OUTLOOK provides estimates for major sectors of GNP in 1991 and industry projections to 1995. Ordinarily, data would have been based partly on the general economic assumptions in the Mid-Session Review of the 1991 Budget, issued in July 1990 by the Office of Management and Budget. However, the Iraqi invasion of Kuwait in early August forced a re-evaluation of the economic outlook, including oil prices, inflation, interest rates, exchange rates, the dollar value of imports, and defense spending.

In view of the uncertainties, a set of ranges for economic growth and other key macro economic variables were used as baseline assumptions for the OUTLOOK. These are shown in Table 1.

Table 1: Range of Key Economic Variables

Item	1990	1991
GNP in constant (1982) dollars, percent change	1.0-2.0	1.0-3.0
GNP deflator, percent change	4.5-5.0	4.0-4.5
Treasury bill rate	7.2-7.5	6.8-7.2
10-year Treasury note rate	8.5-9.0	8.0-8.5
Unemployment rate	5.5-6.0	5.5-6.5

To further assist the industry analysts in making their projections, a set of detailed macroeconomic point estimates were generated that fall within the above ranges (Table 2). These estimates represent one of a number of possible outcomes. The assumptions provided an initial starting point for deriving industry projections, based on computer models and input-output accounts. As usual, analysts relied heavily on their knowledge of specific circumstances affecting their industries. The art of forecasting involves a good deal of judgment.

During the course of writing their chapters, analysts were confronted with the uncertainties of how the Persian Gulf situation would be resolved, with extremely volatile oil prices, and renewed downward pressures on the dollar. Further complicating the analysis was the prolonged process of Federal budget negotiations over taxes and spending.

During the year preceding the Persian Gulf crisis, the nation's economy had been growing modestly, with weakness in certain sectors such as housing, nonresidential construction, and motor vehicles. Annual GNP revisions issued in July 1990 revealed less growth during the previous three years, on balance, than previously estimated. On a quarterly basis, the revised growth rate for real GNP was less than 2 percent since early 1989.

Signs of economic softness continued in late summer and early autumn of 1990. Commerce Department analysts assumed that the economy would avoid a recession, though a soft economic environment would persist into the first half of 1991, followed by a gradual pickup.

The Economy in 1990

The nation's economic performance in 1990 was characterized by quarter-to-quarter volatility in major spending categories of GNP, with modest growth on balance. Inflation rates, interest rates, and foreign exchange rates also

Table 2: Assumptions For 1990–91, Real Gross National Product

(year-to-year percent change in 1982 dollar values)

Item	Actual 1989	Assumed	
		1990	1991
Gross National Product	2.5	1.3	1.4
Personal consumption expenditures	1.9	2.7	1.4
Producers' durable equipment	5.2	1.9	3.9
Nonresidential structures	0	−1.8	−5.5
Residential investment	−4.1	−5.0	−2.4
Government purchases	2.3	0.3	0.4
National defense	−1.7	−4.0	−2.3
Other Federal purchases	16.6	−3.1	1.5
State and Local	2.4	3.2	1.6

Note: Projections for 1990 and 1991 were made in August 1990. The data are intended to inform readers as to the economic assumptions underlying the OUTLOOK and to provide a basis for evaluating the OUTLOOK's projections according to later developments in the economy. For an updated official forecast, readers should refer to the Administration's economic outlook, published in the annual budget document and the *Economic Report of the President*, February 1991.

varied considerably. The year began with a brief acceleration of inflation, reflecting the impact of severe cold weather in late 1989 on food and energy prices. Long-term interest rates rose early in the year, partly responding to developments in Japan and Europe, especially the prospective unification of the Federal Republic of Germany with the German Democratic Republic.

As the year progressed, there was little easing in monetary policy by Federal Reserve authorities. Modest declines in the key federal funds rate occurred in July as an offset to an apparent tightening of credit conditions by commercial banks, and again in late October, following the Federal budget agreement.

Meanwhile, economic growth continued slow and inflation abated for a time. The Administration shaded its forecast of growth in real GNP over the four quarters of 1990—from 2.6 percent projected at the beginning of the year to 2.2 percent in July. In the wake of the Gulf crisis, the Administration adopted a new set of economic assumptions at the end of September. The 1990 growth assumption was scaled down to only 0.7 percent, measured from the fourth quarter of 1989 to the fourth quarter of 1990. As of early November 1990, data for the first three quarters of the year showed an average growth rate of 1.3 percent for real GNP, somewhat better than the assumption made in September.

The Economy in 1991

Against the background of another year of modest growth in GNP assumed for 1991, the major spending sectors likely will continue to show positive and negative changes.

We expect exports of goods and services to remain an important source of growth. The sharp decline in the dollar's foreign exchange value during 1990, including a record low against the German mark, will reinforce the ability of U.S. industry to compete in expanding markets overseas.

Slower growth in real personal consumption expenditures, the largest spending share of GNP, is assumed for 1991—a development that will contribute to slower growth in imports. As 1990 drew to a close, various measures of consumer attitudes were severely depressed, consumers' purchasing power was being eroded, and unemployment was slowly on the rise. A satisfactory outcome of the Persian Gulf situation obviously would help reverse these negative factors in the prospects for consumer spending.

Both residential and nonresidential construction could post another outright decline in 1991 on an annual basis. However, some recovery might be in progress during the course of the year if long-term interest rates decline. The important capital spending category of producers' durable equipment is expected to increase more in 1991 than in 1990.

The assumption for defense spending in 1991 is subject to more uncertainty than usual, given the positioning of U.S. military forces in the Middle East. The assumed decline in real defense purchases in 1991 implies no major hostilities involving U.S. armed forces.

The Federal budget package that was completed in late October 1990 should have little net impact on GNP in 1991. Higher tax rates and cuts in Federal spending ordinarily would tend to restrain economic growth. But a mildly restrictive fiscal policy can be partly offset by a more accommodative monetary policy, which Commerce analysts assumed.

The inflation rate is expected to moderate in 1991 as oil prices retreat from their levels of late 1990. Domestic crude oil prices were predominantly in the range of $30 to $40 a barrel during the writing of the 1991 U.S. INDUSTRIAL OUTLOOK (September–October 1990). Commerce analysts assumed an average price of $25 a barrel during 1991, the same figure assumed by the Department of Energy in its short-run energy forecast, issued in September 1990. With a slowdown in inflation and an easier monetary policy, short-term interest rates are expected to decline in 1991 from the 1990 average.

In summary, economic growth is likely to remain modest through the first half of 1991—with a recovery starting in the later part of the year. However, due to the current uncertainties over the Persian Gulf situation, short-run projections should be used with caution. Over the longer term, an unwinding of inflationary expectations, an easier Fed policy, and implementation of the fiscal deficit reduction agreement, are likely to set the stage for stronger economic growth.

The International Economic Outlook in 1991

by John E. Jelacic

Senior International Economist
Office of Trade and Investment Analysis

Two major developments dominate the outlook for the world economy in 1991—the slowing of economic growth in the United States and in other industrial economies, and the recent increase in oil prices, kindled by the Iraqi invasion of Kuwait in early August 1990. The following discussion of the world economic outlook for 1991 focuses mainly on the effects of these developments. Other important considerations also cloud the economic picture: the serious economic problems of Eastern Europe and the Soviet Union; the huge drop in Japanese stock prices and the coinciding decrease in Japan's foreign investment flows; and the reunification of Germany and the decrease in German capital exports.

Before the Persian Gulf crisis and the runup in the price of oil, most forecasts called for slightly lower global growth in 1990 than in 1989, and an acceleration of growth in 1991. In general, the pre-invasion forecasts were optimistic.

In 1989, the world economy grew by an estimated 3 percent—more than a percentage point slower than in 1988. Despite that slowdown, the underlying rate of inflation in many major economies began to creep up. Late in the decade world inflation rates accelerated, reflecting the upward pressure on the industrial economies' production capacities that was brought about by their lengthy economic expansion in the 1980s.

Reacting to increased inflationary pressures, central banks and the governments in several countries implemented economic policies, both monetary and fiscal, to slow growth. The hope was to engineer a "soft-landing." In the United States, the Federal Reserve started tightening monetary policy in early 1987. In addition, the economic stimulus of the Federal deficit was dampened as it fell from 5.3 percent of gross national product in 1986 to 2.9 percent of GNP in 1989. In 1989 and early 1990, other industrialized countries followed with their own programs to bring inflation under control.

During the first half of 1990, most signs pointed toward a successful execution of these policies. As expected, U.S. and foreign growth was turning out to be slower in 1990 than in 1989, but not so slow as to cause alarm. It appeared that a successful "soft landing" was in the works, and most economic forecasts reflected this view. Moreover, most forecasters also saw continued slow growth in 1991 for most countries, and oil prices in the $18- to $25-per barrel range.

Then, on August 2, Iraqi military forces invaded Kuwait. The ensuing crisis disrupted world oil supplies, caused a doubling of oil prices, and dampened the world economic outlook for 1991. The increase in oil prices has made it more likely that 1990 and 1991 world growth will be below 1989 rates.

Until the Gulf crisis is resolved, the international economic outlook is fraught with uncertainty. The numerous economic forecasts published here and abroad base their conclusions on assumptions about the nature and timing of the outcome of the Middle East situation. Several scenarios through 1991 are possible. However, as of October 1990, none seems more likely than any other. The following discussion is based mainly on a middle-road assumption that a stalemate will persist through 1991.

Given that scenario, an average winter heating season, and additional production from other countries, crude oil prices are likely to be in the $25-$30 per barrel range, or about $10 higher than if the Gulf crisis had not occurred. Under these conditions, world economic growth in 1990 can be expected to be about 0.5 to 1 percentage points less than in 1989, expanding by 2 to 2.6 percent. The rate of growth will be in the same range in 1991.

If peace comes before 1991 and the embargo on Iraqi oil is lifted, oil prices are likely to drop quickly, and the outlook for the world's economy in 1991 would be about the same as it was before the Iraqi invasion. The price of crude would probably stabilize at $20 to $25 per barrel, and perhaps even fall below $20 if adverse reactions to the crisis dampen economic growth below current trends.

If there is a Middle East war, however, oil prices would undoubtedly soar to $50 to $80 per barrel, and there would be a world recession on a scale equal to that of the two that followed the oil disruptions in the 1970s. In 1973-74, oil prices quadrupled from $3 to $13 per barrel, and the ensuing world recession lopped off about 7 percent from cumulative world growth. In the second oil shock of 1979-80, oil prices tripled from $13 to $39 per barrel and the world lost about 5 percent of cumulative growth in the recession that followed.

The Economic Outlook for the Industrial Economies

On average, 2.4 to 2.6 percent economic growth is expected for the industrial economies in 1991 (Table 1), which is about one half percentage point lower than was expected in July 1990. Most of the relative pessimism for the growth of the group as a whole results from the much slower 1991 growth outlook for the United States.

Before the invasion, the three largest industrial economies —the United States, Japan, and Germany—were in different phases of their respective growth cycles. The U.S. economy was slowing while the economies of Germany and Japan were picking up momentum. Forecasts at that time were that in 1991 the relative growth positions of the three economies would reverse themselves, that is, growth in the United States was expected to accelerate while the German and Japanese economies would slow somewhat. The oil price increase caused forecasts to be revised downward, most drastically where oil prices were assumed to remain high through 1991.

Although the U.S. economy is significantly less dependent on imported oil than either Japan or Germany, the oil price hike threatens more damage to the U.S. economy than to either Japan or Germany. There are several reasons for this. First, Germany and Japan consume much less oil per billion dollars of gross domestic product (GDP) than the United States. Based on 1988 data, the United States uses 179,000 metric tons per billion dollars of GDP while Japan and Germany use 146,000 metric tons and 143,000 metric tons, respectively. Second, since oil taxes are much higher in Japan and Germany than in the United States, crude petroleum prices constitute a much larger share of the final price of the end product in the United States. As a result, when crude prices rise, prices of the end products rise by a larger percentage in the United States. Third, since the Gulf crisis a steep drop in the U.S. dollar has mitigated the price hike of oil to Japanese and German purchasers, since the international oil trade is priced in dollars.

Table 1: Growth of World Output, 1982–1991

(annual percentage change of gross domestic product)

	1982–86	1987	1988	1989	1990	1991
World	2.9	3.3	4.1	3.0	2.0-2.6	2.1-2.7
Industrial Countries	2.8	3.4	4.4	3.4	2.6-2.8	2.4-2.6
United States	2.8	3.4	4.5	2.5	0.8-1.3	1.0-2.0
Canada	2.9	4.0	4.4	3.0	0.6-1.1	1.2-2.2
Japan	3.8	4.6	5.7	4.9	4.7-5.2	3.6-4.2
EC	2.0	2.7	3.9	3.5	2.7-3.3	2.4-2.9
Developing Countries	3.4	3.9	4.2	3.0	2.2-2.4	4.0-4.5
Mexico	(0.6)	1.4	1.1	2.5	4.0-4.6	3.9-4.4
Asian NICs	8.0	12.1	9.5	5.5	5.9-6.5	5.7-6.2
Eastern Europe & U.S.S.R.	3.2	2.6	4.1	1.2	(2.5)-(1.5)	(0.5)-0.5

*Figures assume a stalemate in the Persian Gulf crisis.

Note: Source for most of the 1982–89 data is the International Monetary Fund, *World Economic Outlook*, October 1990. Mexico's 1982–89 growth is from the International Monetary Fund, *1990 International Financial Statistics Yearbook* and from the CIA, *Handbook of Economic Statistics, 1990*. Growth data for Eastern Europe and the USSR are from the United Nations *World Economic Survey 1990*.

For other industrial countries, higher oil prices will be harmful; the extent depends on the degree of dependency on imported oil. Canada, Norway, and the United Kingdom, each of which have large domestic oil industries, will suffer least.

In line with recent forecasts of slower real economic growth, the outlook for world trade also is less optimistic than in early 1990. The International Monetary Fund (IMF) recently predicted that world trade volume will expand by 5.4 percent in 1990 and 5.3 percent in 1991, compared with an estimated increase of 7.3 percent in 1989. The IMF predicted that U.S. export volume growth in 1991 will fall to 6 percent, a little more than half the actual growth of U.S. export volume in 1989 and the predicted export growth for 1990. The IMF's world trade projection is based on a slightly more optimistic world growth scenario and lower oil prices than the ones discussed here.

Despite the expected slowdown in U.S. export volume, the IMF predicted that the competitive position of the United States will improve vis-a-vis most industrial countries. Therefore, the IMF predicted that U.S. export growth in 1990 and 1991 will be higher than the export growth of most of the other industrial countries.

The Developing Economies

U.S. exports to the developing areas of the world account for around 35 percent of all U.S. exports, including manufactured goods. Among the many developing countries, none is more important to U.S. trade than Mexico and the four Asian newly industrialized countries (NICs).

In Latin America, economic growth in 1989 averaged an estimated 1.6 percent and is predicted to be about -0.5 percent in 1990 and 3.5 percent in 1991. The large swing in the outlook for Latin America, from expected negative growth in 1990 to a prediction of fairly robust growth of 3.5 percent in 1991, is the primary reason for the acceleration of developing country growth in 1991. There are some significant differences in growth among the countries, especially the big three countries of Mexico, Argentina, and Brazil. Mexico has improved the condition of its economy. Under the leadership of President Carlos Salinas, inflation has slowed and economic growth has accelerated. However, the economies of Argentina and Brazil have been badly hurt by internal economic crises, exacerbated by foreign debt problems, and falling export commodity prices. Growth in both countries is expected to be low or negative in 1990 and 1991.

Mexico is the third most important trade partner of the United States, taking 6 to 7 percent of U.S. exports and accounting for roughly one-half of all U.S. trade with Latin America. Moreover, the United States is by far Mexico's most important market. Around 70 percent of Mexico's non-oil exports are shipped to the United States.

In the past two years, Mexico's economic reforms have had a beneficial effect on growth. In 1988 Mexico's growth was just over 1 percent, but in 1989, on the strength of strong investment and increases in manufacturing, it increased to 2.5 percent. Also, the rate of inflation was cut from more than 100 percent in 1988 to around 25 percent in 1989. As of October, price increases in 1990 were moderate. Even before the recent oil price increase, the outlook for growth in Mexico in 1990-91 was very good—3 to 5 percent.

In recent years Mexico has not invested in additional crude oil production capacity and thus has little excess capacity to increase oil output and exports in the wake of the Mideast crisis. Nevertheless, higher oil prices should stimulate Mexico's economic growth and help its balance-of-payments position, unless the economic slowdown in the United States is more severe than anticipated.

More than 10 percent of U.S. exports are shipped to the four Asian NICs (South Korea, Taiwan, Hong Kong, and Singapore). Before the oil price increase, the outlook for these countries was for continued economic growth in 1990 and 1991 of about 6.4 percent, the same as in 1989. While this projected advance is only about half as large as was achieved in the boom years of 1986–88, these economies were still expecting growth of between 5 and 7 percent in the 1990–91 period, around twice the growth rate anticipated for the rest of the world. Taiwan was the growth leader in 1989 with a rate of 7.2 percent, and Hong Kong was the laggard with a rate of only 2.5 percent.

Since all four of these NICs are heavily dependent on Mideast oil for their energy needs, rising oil prices will adversely affect their growth prospects. Singapore, the largest oil refining center in Asia, is likely to be hurt the least.

In Africa, which experienced two good years of agricultural output in 1988 and 1989, growth is predicted to be around 3 percent in both 1990 and 1991. African growth in 1989 averaged an estimated 3.2 percent. Oil prices, which had been going up even before the August crisis, are expected to boost growth in the oil producing areas of West and North Africa.

Among the countries of the Gulf region and in the Asian subcontinent, the higher prices of oil has had—and will continue to have—dissimilar effects. Oil producers will benefit from the higher oil revenues. Non-oil producers, however, will suffer not only because of the higher energy prices, but also because many of these countries had supplied substantial numbers of workers to Iraq. Most of these workers have now been expelled and their earnings lost. This is placing a heavy burden on these tens of thousands of displaced workers who are now in other countries. Moreover, their home countries no longer receive their repatriated earnings.

Aside from Mexico and the oil-producing Gulf states, only a handful of other oil producing and exporting developing countries will benefit from the higher oil prices, including Venezuela, Nigeria, Malaysia, Indonesia, China and the oil producers in North Africa. The vast majority of developing economies, however, will suffer from the current crisis. Aside from the obvious impact of higher oil import prices, many of these countries, unlike the industrial countries, have significantly increased their dependence on oil imports in recent years.

In addition to raising the cost of imported oil, the crisis exacerbates other economic problems of the developing countries. Those with high debt loads, which includes most of them, face higher interest payments. That is because higher oil prices have raised inflationary expectations and long-term interest rates on the countries' debts. Second, for those developing countries that rely on primary products other than oil for export revenues, earnings in the 1980s were not good. Almost across the board, prices of primary commodities slumped during the decade and the terms of trade of the developing countries thus have moved against them. Slower growth in the industrial countries will again hurt export earnings of the developing countries as slower demand growth in the industrial countries leads to reduced exports of primary products.

Eastern Europe and the U.S.S.R.

The economic outlook for the Eastern European economies, while not very good to begin with, has turned decidedly worse with the increase in oil prices. On top of the problems associated with economic restructuring, the Eastern European economies face an end to deliveries of subsidized oil from the Soviet Union. Beginning in 1991, the former Soviet bloc countries are expected to pay the going world price for their oil imports. As for the U.S.S.R., production problems are limiting its ability to exploit the rise in world oil export prices. Soviet oil production—the world's largest—has actually been falling lately.

The political transformation of Eastern Europe in 1989 unquestionably will have major long-run economic repercussions on the world economy. However, the short-term effects on the United States and most other countries will probably be minor. Aside from the immediate effects of German reunification, the wider economic implications of the pending move to free-market economic systems are difficult to gauge. Recent increases in long-term worldwide interest rates may have partly occurred because of the international financial market's expectation of large Eastern European demands for investment capital. Germany, for example, is expected to supply much less capital to world financial markets because of the task of rebuilding its Eastern sectors. Currently, large, rapid increases in East-West trade and large amounts of Western investment in Eastern Europe in 1990 and 1991 seem unlikely.

The World Oil Market And Inflation Outlook

At this writing, the loss of Iraq and Kuwait oil production and exports may not appear large enough to significantly restrict world economic growth. However, the uncertainty associated with that loss has led to significantly higher oil prices. As a result, and assuming the stalemate in the Middle East continues, the world inflation rate in 1991 is expected to rise 1 to 3 percentage points.

Table 2: The World Oil Market in 1989

Production	Barrels per day (millions)	Share (percent)	Consumption	Barrels per day (millions)	Share (percent)
Kuwait	1.8	2.8	North America	18.2	28.1
Iraq	2.8	4.5	United States	16.6	25.6
Other OPEC	18.6	29.2	Canada	1.7	2.5
Saudi Arabia	5.5	8.6	West Europe	12.5	19.3
Iran	2.9	4.6	W. Germany	2.3	3.5
UAE	2.1	3.3	Italy	1.9	3.0
Other OPEC	8.1	12.7	Other W. Europe	8.3	12.8
Non-OPEC	40.4	63.5	Asia	12.2	18.9
USSR	12.5	19.7	Japan	5.0	7.5
United States	9.2	14.0	China	2.4	3.8
Mexico	2.9	4.6	South Korea	0.8	1.3
China	2.8	4.5	Taiwan	0.5	0.8
United Kingdom	1.9	3.0	USSR & E. Europe	11.0	17.0
Canada	1.7	2.6	USSR	8.8	14.0
Norway	1.5	2.4	Latin America	5.3	8.2
Egypt	0.9	1.4	Middle East	2.9	4.5
India	0.7	1.1	Africa	1.8	2.8
Brazil	0.6	1.0	Australasia	0.8	1.2
Total	63.6	100.0	Total	64.7	100.0

SOURCE: The BP Statistical Review of World Energy, as reproduced in the London *Financial Times*, September 24, 1989.

Kuwait and Iraq combined produced 4.6 million barrels per day in 1989, or 7.3 percent of world production. Table 2 shows the major producers and consumers in the world oil market in 1989.

Several important factors tend to minimize the quantitative impact on economic growth of the loss of Kuwait and Iraq oil production on the industrial economies, compared to the oil shocks of the 1970s: (1) use of unused oil production capacity among the other producing nations—especially Saudi Arabia, Mexico, Venezuela, and Nigeria; (2) substantial world oil stocks held in national reserves and private inventories; (3) slower economic growth, even prior to the invasion, which reduced the growth of energy demand; and (4) a significant reduction in oil input required per dollar of industrial production in the industrialized world.

In August 1990, the spot price of oil jumped almost immediately to $25 per barrel, then continued to increase in fits and starts until it reached more than $40 per barrel by mid-October. Between then and late October, the spot price retreated slightly, but it continued to fluctuate in the mid- to upper-$30s. Most energy analysts are predicting oil prices in the range of $25-to $30-per barrel at least through 1991 in the case of a long-term Gulf stalemate. In the case of a peaceful resolution of the crisis, they predicted a retreat of oil prices to $20 to $25 per barrel.

Summary and Conclusions

Although the mid-1990 outlook for world growth in 1991 was not free of concerns and uncertainties, generally speaking, it was relatively optimistic. European Community economic consolidation was proceeding apace; Germany was in the process of unifying; economic reorganization was being planned (if not implemented) in much of Eastern Europe; economic initiatives to free markets in many of the developing economies of Africa and Latin America had been put in place or were being planned; and there were signs that the remarkable economic growth of the last decade that had transformed the economies of the Asian NICs—South Korea, Taiwan, Hong Kong, and Singapore—was about to spread to some of the other nations in the region, such as Thailand, Malaysia, and Indonesia.

The Iraqi attack on Kuwait and the ensuing runup in world oil prices have caused a reassessment of world economic prospects for 1991. The increase in oil prices has and will continue to have an adverse impact on inflation and economic growth in most of the world's economies. In addition, the crisis has changed expectations to a much greater degree than the of the loss of Iraq and Kuwait oil would warrant. To some extent the changes in expectations have led to new and more realistic assessments of the economic benefits to be gained from such developments as the economic integration of the European Community scheduled for 1992, and the transformation of Eastern Europe to market economies.

A quick, peaceful resolution of the Gulf crisis will help to put the world's economy back on a more positive growth path, not necessarily one as optimistic as was expected earlier in 1990, but one that may be more firmly grounded in a realistic view of what is and what is not possible.

MAJOR TRADE EVENTS IN 1991

AEROSPACE

Trade Event Coordinator: John C. White (202) 377-2835

Event/Location/Date	**Contact**	**Description**
Aerospace Products Information Center (APIC) Japan International Aerospace Exhibition '91 Tokyo, Japan February 14-18	Ludene Capone (202) 377-2835	This event will be held at the New Nippon Convention Center and is organized by the Society of Japanese Aerospace Companies. There will be a U.S. pavilion at this major Japanese aerospace exhibit.
U.S.A. National Pavilion Paris Air Show Paris, France June 13-23	David C. Bowie (202) 377-8228	The Paris Air Show is the world's premier air show and international trade event for the civilian and military aerospace industry. The U.S.A. National Pavilion showcases U.S. aerospace technology.
Aerospace Products Information Center (APIC) Airshow Canada Abbotsford, British Columbia August 7-11	Heather Jones (202) 377-2835	The major North American international trade event, Airshow Canada attracted more than 7,000 professional visitors from more than 40 countries in 1989.
Executive Trade Mission Germany, Spain, and Italy September	John L. Wolf (202) 377-2835	Offering one-on-one meetings with top aerospace executives in Europe, this mission will limit the numbers of participants. If interested, contact the Department of Commerce early.
Aerospace Products Information Center (APIC) Aviation Expo China '91 Beijing, China October 15-20	John C. White (202) 377-2835	This exhibition will draw many decision makers from different regions of China, where airline and airport management and procurement is largely separate from governmental activities.
Aerospace Executive Trade Mission Indonesia and Taiwan November 10-22	John L. Wolf (202) 377-2835	This area of the world is a huge, expanding market, offering incredible opportunities for U.S. aerospace companies. The trade mission will give participants opportunities for one-on-one discussions of aerospace activities in every facet of aviation. This mission will end at the Taipei Aerospace Technology Exhibition.
Aerospace Products Information Center (APIC) Taipei Aerospace Technology Exhibition Taipei, Taiwan November 19-22	Mara Yachnin (202) 377-2835	This event will address the needs and opportunities created by the Taiwan government's decision to establish an aerospace component industry. The APIC will provide an inexpensive way for U.S. companies to be represented at this event.

AUTOMOTIVE AFFAIRS & CONSUMER GOODS

Trade Event Coordinator: Charles Johnson (202) 377-3422

Event/Location/Date	**Contact**	**Description**
Jewelry Trade Mission Tokyo, Japan February 26-28	Ed Kimmel (202) 377-3640	Visits with agents, distributors and leading Japanese retailers of expensive jewelry.
Sporting Goods Trade Mission Tokyo, Japan March 4-8	Reginald Beckham (202) 377-5478	Visits with agents, distributors and leading Japanese retailers.
Equitana '91 Essen, Germany April 13-21	Reginald Beckham (202) 377-5478	Major equestrian show in Europe. *Best Prospects*: Equestrian supplies.
COSMOPROF '91 Bologna, Italy April	Ed Kimmel (202) 377-3640	Largest cosmetic show in Europe. *Best Prospects*: All types of cosmetics.

AUTOMOTIVE AFFAIRS & CONSUMER GOODS—Continued

Trade Event Coordinator: Charles Johnson (202) 377-3422

Event/Location/Date	Contact	Description
Taipei Auto Show Taipei, Taiwan May 13-21	Loretta Allison (202) 377-5479	Largest auto show in Taipei for automotive vehicles and parts.
ISPO Munich, Germany September 5-9	Reginald Beckham (202) 377-5478	Largest sporting goods show in Europe. *Best Prospects*: Team sports merchandise, sports medicine, and general sporting goods.
SISEL Paris, France September 9-11	Reginald Beckham (202) 377-5478	Leading French sporting goods show. *Best Prospects*: General sporting goods, team sports merchandise, and sports medicine.
Tokyo Motor Show Tokyo, Japan October 26-November 8	Loretta Allison (202) 377-5479	Japan's largest auto show for vehicles and parts.
Tokyo International Furniture Fair Tokyo, Japan November 20-24	Ed Kimmel (202) 377-3640	Leading home furniture show in Japan.

BASIC INDUSTRIES

Trade Event Coordinator: Don Trafton (202) 377-2493

Event/Location/Date	Contact	Description
Canadian Hardware Show Toronto, Canada February 3-5	Bob Shaw (202) 377-0132	Canada's premier hardware event. *Best Prospects*: Door locks, door and window hardware, insulation, wallcoverings, panelling, plumbing and electrical supplies, roofing, and do-it-yourself items.
Alloys/Advanced Materials Japan Intern'l Air Show-91 Tokyo, Japan February 14-18	Gene Quinn (202) 377-0578	Japan's major aerospace exhibition. *Best Prospects*: Advanced composites and materials, alloys, and wire and cable products for aerospace industries.
Alloys/Advanced Materials Paris Air Show Paris, France June 13-23	Gene Quinn (202) 377-0578	World's premier aerospace exhibition. *Best Prospects*: Advanced composites and materials, alloys, and wire and cable products for aerospace industries.

CAPITAL GOODS & INTERNATIONAL CONSTRUCTION

Trade Events Coordinator: Jerry Morse (202) 377-5907

Event/Location/Date	Contact	Description
Environmental Systems Trade Mission Korea, Hong Kong, and Taiwan January 23-February 2	Damon Greer (202) 377-5456	Environmental problems in these countries open significant business opportunities for companies offering consulting services, equipment, and engineering and design services. *Best Prospects*: Air, water, hazardous wastes, resource recovery, and remediation technologies for municipal, commercial, and industrial applications.
PLASTICOS '91 Trade Fair Mexico City, Mexico February 12-15	Eugene Shaw (202) 377-3494	A proven, highly successful all-U.S. exhibition and conference directed at Mexico's dynamic plastics industry, which has posted a growth rate of 32 percent annually since 1983. *Best Prospects*: Primary processing machinery of all types, auxiliary equipment, controls and control systems, molds and tooling, quality control and test instrumentation, production software and systems, resins, additives, colorants, and specialized process chemicals and agents.
Middle East Oil Show Manama, Bahrain March 2-5	George Zanetakos (202) 377-0552	Biennial oil and gas field equipment and services exhibition for the Middle East market. *Best Prospects*: Pumps and pumping equipment, drilling equipment, geophysical instruments and services, wellhead equipment, and maintenance services.

CAPITAL GOODS & INTERNATIONAL CONSTRUCTION—Continued

Trade Events Coordinator: Jerry Morse (202) 377-5907

Event/Location/Date	**Contact**	**Description**
Saudi Air Con '91 Riyadh, Saudi Arabia March 10-14	Tyrena Holley (202) 377-3509	This event is the first solo exhibition dedicated to the air conditioning and refrigeration industry, held in conjunction with Elenex, a premier trade event in the Middle East. *Best Prospects*: Air conditioning, ventilation, heating, refrigeration, and engineering systems and equipment; HVAC control equipment, and contracting and consulting services.
Environmental Technology Trade Mission Thailand, Malaysia, and Indonesia April	Damon Greer (202) 377-5456	This trade mission responds to interest in this part of the world in cleaning up sources of contamination to promote economic growth. *Best Prospects*: Air, water, hazardous wastes, and resource recovery technologies for municipal, commercial, industrial and high technology electronics manufacturing processes.
Environmental Technology Trade and Investment Mission Czechoslovakia and Hungary May 15-30	Damon Greer (202) 377-5456	As Eastern Europe develops free market economies, this mission responds to interest in the region for protecting the environment to encourage economic growth. *Best Prospects*: Technologies for treating air, water, and solid and hazardous wastes; resource recovery; and point-of-use water treatment technologies for municipal, commercial, and industrial applications.
TECHNOLOGY '91 Trade Fair Tel Aviv, Israel May 5-9	Patrick McGibbon (202) 377-0314	Israel's largest and most important technical exhibition offering outstanding exposure for U.S. products and services to Israel's high technology industries. *Best Prospects*: Metalworking equipment, including machine tools, robotics, industrial machinery, and measuring, testing, and processing equipment; pumps, valves, and compressors; electric generators; computers, peripherals, and software; scientific instruments; electronics; laser technology; and industrial building equipment.
Malaysian Petrochemical Show June 11-14	Mary Wiening (202) 377-4708	The fourth Malaysian oil, gas, and petrochemical engineering exhibition for the Far East. *Best Prospects*: Petroleum exploration and production machinery, pipeline equipment, and petrochemical equipment.
Food Processing and Packaging Trade Mission Chile, Argentina, and Mexico June	Eugene Shaw (202) 377-3494	Meetings with key government and private sector buyers interested in upgrading food production capabilities. *Best Prospects*: Processing and packaging equipment for beverage, dairy, meat, and poultry products; and fruits and vegetables.
Environmental Technology Trade and Investment Poland and Yugoslavia September	Damon Greer (202) 377-5456	This trade mission focuses on awareness in Eastern Europe of the importance of protecting the environment to foster and sustain economic growth. *Best Prospects*: Technologies for municipal, commercial, and industrial applications in resource recovery, point-of-use water treatment, and treating air, water, and solid and hazardous wastes.
ECOLOGIA '91 Trade Fair Mexico City, Mexico November	Loretta Jonkers (202) 377-0564	This trade event will reflect the high level of attention focused on Mexico's environment in its government and business community. *Best Prospects*: Air, water, solid and hazardous wastes technologies, resource recovery, and point-of-use water treatment technologies for municipal, commercial and industrial applications.

SCIENCE & ELECTRONICS

Trade Events Coordinator: Jake Moose (202) 377-4125

Event/Location/Date	**Contact**	**Description**
U.S. Executive-level Computer Hardware and Software Trade Mission Czechoslovakia, Poland, and Germany February 4-12	Vivian Spathopoulos (202) 377-0572	Event gives a complete introduction to these computer markets. It will offer companies tailored one-on-one business appointments with end-users and distributors.
Trade Mission Korea, Taiwan March 10-15	Terry Rettig (202) 377-2952	Telecommunications equipment, including broadcasting.
IFSEC London, England March 18-22	Dwight Umstead (202) 377-8410	The leading international exhibition and conference for fire protection and security equipment.

SCIENCE & ELECTRONICS—Continued

Trade Events Coordinator: Jake Moose (202) 377-4125

Event/Location/Date	**Contact**	**Description**
Inepcon/Semiconductor Korea Seoul, Korea April 2-4	Joseph Burke (202) 377-5014	Korea's leading exhibition and conference for electronics manufacturing, processing, assembly, and testing.
Executive-level Computer Hardware and Software Trade Mission Latin America April 22-26	Maria de la Guardia (202) 377-2053	Mission will visit Caracas, Venezuela and Santiago, Chile to promote U.S. computer hardware and software products in these growing markets.
Trade Mission India April	Terry Rettig (202) 377-2952	Telecommunications equipment.
Achema Frankfurt, Germany June 6-15	Geoffrey Gwaltney (202) 377-3090	The world's largest chemical engineering show.
Informatica Int'l Trade Fair Compute USA Pavilion Sao Paulo, Brazil September 23-27	Judy A. Fogg (202) 377-4936	Annual international trade fair for computers, peripherals, and software. *Best Prospects*: Analog, digital hybrid computers and line processor/controlling units; central processing units (CPU) for electronics computing systems; magnetic disk/tape units, peripheral controllers, modems, and video/graphic terminals; and sophisticated computer software, including operating systems, utilities, CAD/CAM, graphics, PCI, and telecommunications.
Software Exhibition and Trade Mission Tokyo, Japan October	Heidi Hijikata (202) 377-0571	Sponsored by the U.S. Department of Commerce and Japan's ministry of foreign trade, this exhibition and trade mission promotes new-to-market (Japan) packaged software.
SYSTEMS '91 USA Pavilion Munich, Germany October 22-26	Vera A. Swann (202) 377-0396	International trade fair for computer software and hardware firms.
Productronica Munich, Germany November	Joseph Burke (202) 377-5014	A leading international biennial exhibition for electronics industry production and test equipment.
Componic Paris, France November	Joseph Burke (202) 377-5014	A leading international biennial exhibition for electronic components.
Trade Mission Argentina, Chile January, 1992	Terry Rettig (202) 377-2952	Telecommunications equipment.

SERVICES

Trade Event Coordinator: Mary Inoussa (202) 377-5820

Event/Location/Date	**Contact**	**Description**
Computer and Information Services Trade Mission France, Italy, and Spain April 22-May 3	Mary Inoussa (202) 377-5820	This specialized event is organized for companies interested in establishing relationships with European computer and information services providers. *Best prospects*: data processing, network services, computer professional services, online databases, and information brokers.
Accounting, Management, and Consulting Seminar Mission Hungary, Poland, and Czechoslovakia May	Marc Chittum (202) 377-0345	Gain market leads, exposure, and an opportunity to meet potential customers. *Best Prospects*: operational and organizational issues, joint-ventures, strategic planning, generally accepted accounting principles, managerial accounting, and cost accounting.

TEXTILES & APPAREL

Trade Event Coordinator: Monica Montavon (202) 377-8857

Event/Location/Date	**Contact**	**Description**
HEIMTEXTIL-ASIA Exhibition U.S. Pavilion Tokyo, Japan January 31-February 3	Lawrence Brill (202) 377-8856	Second annual international textile homefurnishings show. *Best Prospects*: Bed and bath linens and decorative fabrics.
SEHM, International Men's Apparel Show U.S. Pavilion Paris, France February 2-5 September 7-10	Monica Montavon (202) 377-8857	International men's apparel show with 950 exhibitors and 50,000 *Best Prospects*: Men's sportswear and outerwear.
U.S. Solo Exhibition Men's and Women's Apparel Tokyo, Japan February 13-15	Van Tran (202) 377-5155	Fourth annual U.S. solo apparel exhibition with 35 exhibitors buyers. *Best Prospects*: Men's and women's sportswear and outerwear.
Techtextil, Industrial Fabric Show U.S. Pavilion Frankfurt, Germany May 14-16	Monica Montavon (202) 377-8857	Fourth international edition will feature more than 500 exhibitors. *Best Prospects*: Specialty yarns and coated and laminated product
STAR Homefurnishings Trade Show U.S. Pavilion Milan, Italy May 16-19	Lawrence Brill (202)377-8856	International textile homefurnishings show with 80,000 buyers exhibitors. *Best Prospects*: Textile homefurnishings products.
U.S. Pavilion at MOTEXHA Dubai, United Arab Emirates October 23-26	William Dawson (202) 377-4324	Largest fashion and textile fair in the Middle East with 200 exhibi 13 countries. *Prospects*: Children's apparel, lingerie, and home textiles.

Highlights of the *1991 Outlook*

by Jonathan C. Menes

Director, Office of Finance, Industry, and Trade Information

Despite some weakness in the economy, the picture that emerges from the individual industry reviews is one of continued but slowing growth. Although consistent and comparable data are not available, the declines appear to be more sharp for manufacturing than for services.

For manufacturing, the downturn between 1990 and 1991 is much more moderate than it was between 1989 and 1990. The growth rate for all industries covered is expected to decline from 1.38 percent to 1.13 percent.

Table 1: Growth Rate for Manufacturers Shipments For All Industries Covered

(based on constant dollars)

Item	1988	1989	1990	1991
Median Rate	3	2.1	0.95	0.89
Mean Rate	4.79	1.27	1.16	0.91

SOURCE: *U.S. Industrial Outlook* datafiles

Within the manufacturing sector projected growth varies considerably. As was the case last year, certain industries, particularly those related to construction and motor vehicles, will continue to languish, while most high-technology industries should continue to outperform aggregate economic growth.

The computer and electronic components industries, in addition to being among the fastest growing, are also forecast to grow more quickly in 1991 than in 1990. Although it is difficult to calculate changes in real output for these industries, their more rapid growth is a strong indication of two important trends: increased use of automation to improve productivity, and the expanded demand for information services. Aircraft equipment and parts, including engines, will enjoy another strong year. Although the industry's growth rate in 1990 was lower than in 1989, overall output should set a new record in 1991.

Except for machine tools, the more traditional sectors of the economy reflect the overall cyclical slowdown much more than the high technology industries. Most prominent of these industries is motor vehicles, which appears headed for another flat year. As a result, industries that supply the motor vehicle industry, including steel and glass, are expected to show zero or negative growth.

Table 2: Growth Rate Estimates and Projections For Selected Industry Groups

(based on constant dollar shipments)

Industry	1988	1989	1990	1991
New construction	−0.7	−1.5	−1.6	−2.8
Construction materials	0.2	1.5	−0.8	−3.2
Food and beverages	2.5	1.4	1.3	1.3
Wood products	−0.4	−0.3	−1.6	−3.5
Paper and allied products	3.6	1.3	1.6	2.2
Printing and publishing	0.7	2.1	1.0	2.1
Chemicals and allied products	4.6	2.0	1.6	1.0
Rubber and plastic products	2.2	1.1	1.0	0.8
Steel mill products	15.6	0.3	−1.0	−4.8
Machine tools	4.3	18.6	5.3	5.0
Computers and peripherals*	14.9	6.1	4.4	5.6
Industrial machinery	10.7	4.7	2.5	1.9
Telephone and communication equipment	1.8	2.6	1.9	1.9
Electronic components and accessories	13.8	6.7	1.8	6.2
Electrical equipment	7.6	0.7	−1.1	−2.3
Motor vehicles and parts	5.5	0.0	−2.6	−1.4
Aircraft and parts	5.5	−14.0	17.9	4.6
Scientific and medical equipment	7.6	7.0	2.1	2.9
Household consumer durables	2.8	1.3	−2.0	−2.0

*In current dollars.

SOURCE: *U.S. Industrial Outlook* datafiles

The construction sector will experience another decline in 1991, with widespread effects on economic growth. Because of weakness in the real estate industry and general tightening of credit, demand for most types of new construction has dropped sharply. The aggregate figure for new construction in place masks much weaker performances in several areas, especially commercial real estate and hotel construction, where overbuilding is a major problem. As with motor vehicles, industries tied to construction are expected to perform poorly, except where exports are helping to support demand. These include household durables, construction materials, steel mill products, and wood products.

Trade

The 1991 Outlook features expanded coverage of trade and international competitiveness. Trade—and exports in particular—have played an important role in sustaining the U.S. economy over the last several years. In the first three quarters of 1990, export growth accounted for about 70 percent of GNP growth, even though exports constitute only about 10 percent of GNP. Based on industry assessments, exports in 1991 will again be an important force in fueling domestic economic growth. For the manufacturing industries reviewed, export growth is estimated to average around 8 percent in 1991, down from an estimated 12 percent in 1990—but still a good performance. [As a result of changes in the measurement of U.S. exports to Canada, 1990 export growth rates for individual industries may be overstated. See page 1, How to Get the Most Out of This Book]. Industries accounting for the largest export gains are aircraft and parts, computers, motor vehicles, electronic components, medicinals, plastic products, and petrochemicals.

Manufacturing Industries

The 1991 Outlook contains forecasts for 184 manufacturing industries and industry groups. These industries account for more than 75 percent of total shipments of manufactured goods. About 60 percent of the industries are expected to have positive growth in 1991, virtually the same percentage as in 1990.

Table 3: Distribution of 1991 Forecast Growth Rates for Manufacturing Industries

Rate of Growth	5 and over	4.9 to 3.0	2.9 to 1.0	0.9 to .01	0 to −1.9	−2.0 to −3.9	−4.0 and under
Number of industries	17	21	53	19	21	33	21
Percent of total	9.2	10.9	28.8	10.3	11.4	17.9	11.4
Percent of total shipments	11.8	13.9	31.5	12.6	17.4	5.8	7.0

SOURCE: U.S. *Industrial Outlook* datafiles.

Fastest Growing Industries: With one exception, the ranking of the fastest growth industries offers no surprises. The list is dominated by high-technology and health-related industries. The presence of SIC 3111, leather tanning, probably does not signal any overall trend, but is rather the result of special factors which affect that particular industry.

Table 4: 10 Fastest Growing Four-Digit Industries in 1991

(based on constant dollar shipments)

SIC Code	Industry	Percent Change
3111	Leather tanning and finishing	9.4
3674	Semiconductors and related devices*	8.9
3841	Surgical and medical instruments	8.6
3842	Surgical appliances and supplies	7.6
2833	Medicinals and botanicals	7.1
2835	Diagnostic substances	6.9
2015	Poultry slaughtering and processing	6.8
2836	Biological products except diagnostics	6.2
3721	Aircraft	6.0
3843	Dental equipment and supplies	5.9

SOURCE: U.S. *Industrial Outlook* datafiles.
*In current dollars.

The 5 percent growth rate forecast for machine tools reflects some important underlying developments within a number of key industries. Historically, machine tools follow the direction of the overall economy. However, this does not seem to be the case for 1991. One reason is that businesses are investing heavily to increase efficiency and productivity to stay competitive. In addition, businesses across a broad spectrum of the manufacturing sector are gearing up to meet new regulations, particularly the 1990 amendments to the Clean Air Act. This gives a further boost to demand for machine tools and other capital equipment. Examples include the motor vehicle industry, which must comply with new fuel economy standards, and the paper industry, which must make massive investments in new, less polluting technologies.

Table 5: 10 Fastest Growing Four-Digit Industries: 1987–1991

(based on constant dollar shipments)

SIC Code	Industry	Annual Compound Rate
3844	X-ray apparatus and tubes	10.9
3845	Electromedical equipment	10.7
2833	Medicinals and botanicals	9.8
3674	Semiconductors and related devices*	8.9
3541-2	Machine tools	8.1
3523	Farm machinery and equipment	8.0
3533	Oil and gas field machinery	7.8
3571,2,5,7	Computers and peripherals*	7.7
3842	Surgical appliances and supplies	7.7
3841	Surgical and medical instruments	7.3

SOURCE: U.S. *Industrial Outlook* datafiles.
*In current dollars.

The fastest growing industries for the four-year period 1987-90 are similar to the fastest growing industries in 1991. This suggests that little change in basic economic trends is expected.

Slowest Growing Industries: The slowest growing segments of the economy cover a wide range of industries, all of which are suffering from different problems.

Table 6: 10 Slowest Growing Four-Digit Industries in 1991

(based on constant dollar shipments)

SIC Code	Industry	Percent Change
2021	Creamery butter	−14.6
2451	Mobile homes	−9.5
2053	Frozen bakery products, except bread	−6.3
3732	Boat building and repairing	−6.3
3621	Motors and generators	−6.2
3631	Household cooking equipment	−6.0
2426	Hardwood dimension and flooring mills	−5.0
3634	Electric housewares and fans	−5.0
3441	Fabricated structural metal	−5.0
2421	Sawmills and planing mills, general	−5.0

SOURCE: U.S. *Industrial Outlook* datafiles.

In a number of industries, such as flooring and appliances, cyclical factors, especially the downturn in construction, are slowing growth. In other industries, longer-term factors are at work. For example, demand for creamery butter is declining as a result of shifting consumer preferences for lighter food. For motors and generators, the problem is more one of foreign competition coupled with slow growth in demand. This mix of cyclical and secular trends is typical for the industries at the bottom of the growth chart.

Service Industries

Interpreting service industry data is made difficult by the lack of consistent data and the use of current dollars rather than constant dollars. Based on the figures for those industries for which forecasts do exist, there seems to be no discernible change in overall trends in 1991. The most noteworthy is continued strong growth forecast for health services and information services. Health care has risen from 2.4 percent of GNP in 1980 to approximately 12 percent in 1990, and the upward trend appears to be continuing despite government and private sector efforts to contain health-care costs.

The demand for information services continues to expand, creating demand both for hardware and software. There seems little to indicate any change in this basic trend.

Professional services, such as accounting and management consulting, should continue to expand at a good pace. This trend reflects in part the continued contracting out for specialized services.

Table 7: Growth Rates for Selected Service Industries

Industry	Unit of Measure	Rate of Growth (percent)	
		1990	1991
Electronic information services	Revenues	NA	20.0
Computer software	Revenues	20.0	20.0
Computer professional services	Revenues	NA	17.3
Data processing	Revenues	15.0	16.0
Acounting	Receipts	12.6	12.7
Health services	Revenues	11.9	12.0
Cable television	Revenues	NA	12.0
Management and consulting, and public Relations	Receipts	9.9	10.3
Leasing	Equipment cost added	8.5	8.1
Life insurance	Premiums	8.8	8.0
Property-casualty insurance	Net premiums written	4.4	6.2
Total retail trade	Sales	6.0	6.0
Food retailing	Sales	7.2	7.7
Eating and drinking places	Sales	8.5	6.2
Department stores	Sales	6.0	6.2
Apparel and accessories stores	Sales	5.7	6.1
Advertising	Receipts	5.1	5.6
Banking	Assets	5.0	5.5
Prerecorded music	Manufacturers' dollar value	4.0	5.0
Legal services	Receipts	4.9	4.8
Home entertainment	Revenues	NA	4.0
Motion picture theaters	Receipts	0.0	1.6
Space commerce	Revenues	29.0	0.0

SOURCE: *U.S. Industrial Outlook* datafiles.

Table 8: Forecast Growth Rates for 184 Manufacturing Industries

SIC Code	Industry	Shipments (1987 dollars)				Growth 1987-91	
		Outlook Chapter	1991 (bil.)	Growth Rate (90-91)	Rank	Compound Annual Rate	Rank
2011	Meat packing plants	33	45.539	0.2	109	0.3	109
2013	Sausages and other prepared meats	33	8.002	1.0	79	2.0	79
2015	Poultry slaughtering and processing	33	18.95	6.8	7	6.2	7
2021	Creamery butter	33	1.134	−14.6	184	−5.5	184
2022	Cheese, natural and processed	33	14.344	0.4	106	2.6	106
2023	Dry, condensed, evaporated products	33	5.74	−4.2	171	−0.5	171
2024	Ice cream and frozen desserts	33	3.84	−1.4	126	−0.5	126
2026	Fluid milk	33	20.406	−0.9	119	−0.2	119
203A	Canned foods (SIC 2032-5)	33	26.839	1.5	66	2.7	66
203B	Frozen foods (SIC 2037-8)	33	13.279	3.0	35	2.1	35
2043	Cereal breakfast foods	33	6.887	0.7	97	1.2	97
2051	Bread, cake, and related products	33	15.294	0.8	96	−1.4	96
2052	Cookies and crackers	33	6.743	3.5	31	1.7	31
2053	Frozen bakery products, except bread	33	1.114	−6.3	182	−1.1	182
2064	Candy and other confectionery products	33	7.684	1.8	59	2.4	59
2082	Malt beverages	33	14.679	1.8	58	1.9	58
2084	Wines, brandy, and brandy spirits	33	3.745	1.0	83	4.2	83
2085	Distilled and blended liquors	33	3.429	0.6	100	−0.1	100
2086	Bottled and canned soft drinks	33	25.409	3.8	25	3.7	25
2386	Leather and sheep-lined clothing	35	0.186	−3.6	162	−2.0	162
2411	Logging	6	10.072	−2.7	145	−1.9	145
2421	Sawmills and planing mills, general	6	16.439	−5.0	175	−1.3	175
2426	Hardwood dimension and flooring mills	6	1.517	−5.0	178	−3.0	178
2431	Millwork	6	8.46	−3.0	154	−2.4	154
2435	Hardwood veneer and plywood	6	1.914	−3.0	148	−1.8	148
2436	Softwood veneer and plywood	6	4.416	−5.0	174	−2.7	174
2448	Wood pallets and skids	6	1.885	1.3	72	5.9	72
2451	Mobile homes	5	2.996	−9.5	183	−7.6	183
2491	Wood preserving	6	2.076	1.3	73	−1.1	73
2493	Reconstituted wood products	6	2.948	−1.8	128	0.7	128
2511	Wood household furniture	38	7.288	−2.1	140	−2.2	140
2512	Upholstered household furniture	38	4.963	−2.1	138	−1.5	138
2514	Metal household furniture	38	1.966	−2.1	139	−2.1	139
2515	Mattresses and bedsprings	38	2.186	−2.1	141	−2.5	141
2517	Wood TV and radio cabinets	38	0.317	−2.2	142	−2.5	142
2519	Household furniture, nec	38	0.376	−2.1	137	−1.8	137
2611	Pulp mills	10	4.224	1.0	89	−0.5	89
2652	Setup paperboard boxes	10	0.435	0.9	92	−0.1	92
2653	Corrugated and solid fiber boxes	10	17.113	2.0	51	1.5	51
2655	Fiber cans, drums, and similar products	10	1.575	1.3	74	0.6	74
2656	Sanitary food containers	10	2.403	1.5	68	3.6	68
2657	Folding paperboard boxes	10	5.953	1.5	67	1.1	67
2671	Paper coated and laminated, packaging	10	2.56	1.6	62	1.5	62
2672	Paper coated and laminated, nec	10	7.233	4.0	22	5.3	22
2673	Bags: plastics, laminated, and coated	10	4.775	1.0	85	1.1	85

Table 8: Forecast Growth Rates for 184 Manufacturing Industries—Continued

SIC Code	Industry	Shipments (1987 dollars)				Growth 1987-91	
		Outlook Chapter	1991 (bil.)	Growth Rate (90-91)	Rank	Compound Annual Rate	Rank
2674	Bags: uncoated paper and multiwall	10	2.47	0.8	95	0.2	95
2675	Die-cut paper and board	10	1.789	1.5	63	0.6	63
2676	Sanitary paper products	10	12.505	2.5	41	1.7	41
2677	Envelopes	10	2.877	2.5	44	2.6	44
2678	Stationery products	10	1.245	1.4	71	0.6	71
2679	Converted paper products, nec	10	4.084	2.0	50	3.4	50
26PM	Paper and paperboard mills (SIC 262,263)	10	47.498	2.5	42	2.7	42
2711	Newspapers	26	29.312	−0.6	117	−2.1	117
2721	Periodicals	26	18.587	1.8	56	1.8	56
2731	Book publishing	26	14.143	3.0	36	2.9	36
2732	Book printing	26	3.97	2.5	45	5.1	45
2741	Miscellaneous publishing	26	7.275	3.4	32	−1.8	32
275	Commercial printing	26	51.285	3.5	29	3.5	29
2761	Manifold business forms	26	7.431	0.2	110	0.2	110
2771	Greeting cards	26	3.056	1.0	91	1.2	91
2782	Blankbooks and looseleaf binders	26	3.11	3.2	33	1.7	33
2789	Bookbinding and related work	26	1.16	0.9	94	−0.3	94
2791	Typesetting	26	2.106	4.7	19	4.2	19
2796	Platemaking services	26	2.866	5.2	15	4.8	15
281A	Industrial inorganic chemicals except pigments (SIC 2812,13,14)	13	20.005	2.9	38	3.6	38
2821	Plastics materials and resins	14	27.496	1.0	81	1.2	81
2822	Synthetic rubber	14	4.116	0.5	105	5.8	105
2833	Medicinals and botanicals	45	4.865	7.1	5	9.8	5
2834	Pharmaceutical preparations	45	37.715	3.5	30	4.1	30
2835	Diagnostic substances	45	2.509	6.9	6	3.3	6
2836	Biological products except diagnostic	45	1.997	6.2	8	5.5	8
2841	Soap and other detergents	36	12.365	2.7	39	1.7	39
2842	Polishes and sanitation goods	36	6.075	2.5	40	2.1	40
2843	Surface active agents	36	3.615	5.2	14	4.8	14
2844	Toilet preparations	36	18.1	4.0	21	5.5	21
2851	Paints and allied products	13	13.549	1.0	82	1.6	82
286A	Organic chemicals, except gum and wood (SIC 2865,2869)	13	59.331	0.9	93	3.8	93
287A	Agricultural chemicals, except fertilizer mixing (SIC 2873,74,79)	13	14.409	5.9	11	3.5	11
2891	Adhesives and sealants	13	4.932	2.5	43	1.3	43
28M	Miscellaneous chemicals (SIC 2816,61,75,92,93,99)	12	9.046	−0.1	184	−13.4	184
28PC	Petrochemicals (SIC 2821,22,24,43,65,69,73,95)	12	107.985	1.0	87	2.8	87
3011	Tires and inner tubes	14	11.511	1.0	80	2.5	80
3021	Rubber and plastics footwear	14	0.582	0.5	101	1.1	101
3052	Rubber and plastics hose and belting	14	2.547	2.0	47	2.9	47
3069	Fabricated rubber products, nec	14	6.632	2.0	48	6.0	48
3085	Plastics bottles	14	3.121	1.9	54	2.4	54
3088	Plastics plumbing fixtures	7	0.72	−2.6	144	0.4	144
308A	Miscellanous plastic product except bottles and plumbing (SIC 3081,84,86,87,89)	14	59.237	0.5	103	0.4	103
3111	Leather tanning and finishing	35	2.439	9.4	1	2.4	1
3142	House slippers	35	0.187	−4.1	170	−5.3	170
3143	Men's footwear, except athletic	35	1.603	−4.0	165	−6.6	165
3144	Women's footwear, except athletic	35	1.103	−3.0	147	−4.3	147
3149	Footwear, except rubber, nec	35	0.518	2.0	53	5.4	53
3151	Leather gloves and mittens	35	0.17	−1.2	124	−2.1	124
3161	Luggage	35	0.902	−1.0	121	−0.7	121
3171	Women's handbags and purses	35	0.44	−2.9	146	−5.4	146
3172	Personal leather goods, nec	35	0.403	0.5	104	0.6	104
3211	Flat glass	7	2.382	−5.0	173	−1.7	173
3221	Glass containers	11	4.888	0.2	108	0.6	108
3241	Cement, hydraulic	7	4.05	−3.1	158	−1.6	158
3251	Brick and structural clay tile	7	1.129	−3.9	164	−2.6	164
3253	Ceramic wall and floor tile	7	0.758	−3.4	159	1.4	159
3261	Vitreous plumbing fixtures	7	0.983	−1.6	127	5.6	127
3271	Concrete block and brick	7	2.259	−3.5	160	0.1	160
3272	Concrete products, nec	7	5.853	−3.7	163	0.1	163
3273	Ready-mixed concrete	7	12.581	−3.0	150	−0.8	150
3275	Gypsum products	7	2.485	−2.0	131	−1.8	131
3296	Mineral wool	7	3.388	0.6	99	1.0	99
331A	Steel mill products (SIC 3312,15–17)	15	55.8	−4.8	172	2.2	172
3411	Metal cans	11	12.299	1.5	65	2.8	65
3431	Metal sanitary ware	7	0.829	−1.9	130	0.8	130
3432	Plumbing fixture fittings and trim	7	2.3	−0.4	116	−0.6	116
3441	Fabricated structural metal	7	8.182	−5.0	176	−1.4	176
3448	Prefabricated metal buildings	7	3.219	−4.0	166	0.6	166
3451	Screw machine products	16	3.15	−1.0	122	2.9	122
3452	Bolts, nuts, rivets, and washers	16	5.135	−2.0	134	0.2	134
3465	Automotive stampings	37	15.98	0.0	111	1.2	111
349A	Valves and pipe fittings (SIC 3491,94)	16	7.538	0.5	102	2.0	102
3523	Farm machinery and equipment	20	9.372	1.2	75	8.0	75
3524	Lawn and garden equipment	38	4.59	−1.0	120	−0.0	120
3531	Construction machinery	20	15.475	2.0	46	4.9	46
3532	Mining machinery	20	1.639	2.0	52	1.9	52
3533	Oil and gas field machinery	20	3.68	5.0	17	7.8	17
3544	Special dies, tools, jigs and fixtures	19	7.681	4.0	23	0.4	23

Table 8: Forecast Growth Rates for 184 Manufacturing Industries—Continued

SIC Code	Industry	Shipments (1987 dollars)				Growth 1987-91	
		Outlook Chapter	1991 (bil.)	Growth Rate (90-91)	Rank	Compound Annual Rate	Rank
3546	Power-driven handtools	19	2.558	1.0	88	4.3	88
3548	Welding apparatus	19	2.686	3.0	34	6.3	34
354A	Machine tools (SIC 3541,3542)	19	6.269	5.0	16	8.1	16
3552	Textile machinery	20	1.62	3.5	28	6.9	28
3554	Paper industries machinery	20	2.267	3.5	27	5.0	27
3555	Printing trades machinery	20	3.213	1.0	78	3.0	78
3556	Food products machinery	20	2.136	1.7	61	2.0	61
3562	Ball and roller bearings	16	3.63	−0.8	118	−0.6	118
3565	Packaging machinery	20	2.261	−2.3	143	0.8	143
357A*	Computers and peripherals (SIC 3571,-2,-5,-7)	28	75	5.6	12	7.7	12
3585	Refrigeration and heating equipment	20	20.12	1.8	57	4.3	57
3592	Carburetors, pistons, rings, and valves	37	2.472	−2.0	132	2.0	132
3612	Transformers, except electronic	21	3.562	1.0	90	2.0	90
3613	Switchgear and switchboard apparatus	21	5.412	1.5	69	2.5	69
3621	Motors and generators	21	6.633	−6.2	180	−0.4	180
3625	Relays and industrial controls	21	6.42	−3.0	153	1.3	153
3631	Household cooking equipment	38	3.31	−6.0	179	−0.6	179
3632	Household refrigerators and freezers	38	3.76	−3.0	156	1.7	156
3633	Household laundry equipment	38	3.071	−4.0	168	0.3	168
3634	Electric housewares and fans	38	2.712	−5.0	177	−1.0	177
3635	Household vacuum cleaners	38	1.5	−3.5	161	3.2	161
3639	Household appliances, nec	38	2.315	−3.0	155	−0.9	155
3643	Current-carrying wiring devices	8	4.41	−0.1	113	3.5	113
3644	Noncurrent-carrying wiring devices	8	2.491	−4.0	169	−3.8	169
3647	Vehicular lighting equipment	37	2.081	−2.0	136	1.4	136
364A	Lighting fixtures (SIC 3645,46,48)	8	5.691	−4.0	167	−2.1	167
3651	Household audio and video equipment	38	7.212	3.0	37	5.1	37
3661	Telephone and telegraph apparatus	30	19.213	1.5	64	2.2	64
366A	Radio comm. and det. equip. (SIC 3663,3669,3812)	31	56.944	2.0	49	2.0	49
3674*	Semiconductors and related devices	17	27.859	9.0	2	8.9	2
367A	Electronic parts ex. semicon. (SIC 3671-72,75-79)	17	38.039	4.2	20	5.7	20
3691	Storage batteries	37	3.36	−3.0	152	0.4	152
3694	Engine electrical equipment	37	6.27	−3.0	151	−4.3	151
3711	Motor vehicles and car bodies	37	131.5	−1.3	123	−0.3	135
371A	Automotive parts and acce. (3465,3592,3647,3691)	37	96.954	−1.4	125	1.2	125
3721	Aircraft	22	46.942	6.0	9	4.7	9
3724	Aircraft engines and engine parts	22	21.039	3.9	24	0.9	24
3728	Aircraft parts and equipment, nec	22	18.41	1.9	55	0.7	55
3731	Ship building and repairing	23	8.837	0.3	107	1.0	107
3732	Boat building and repairing	39	4.085	−6.3	181	−6.5	181
3751	Motorcycles, bicycles, and parts	39	1.119	1.7	60	1.3	60
3761	Guided missiles and space vehicles	22	26.952	1.1	76	5.7	76
3764	Space propulsion units and parts	22	4.574	1.0	86	6.6	86
3769	Space vehicle equipment, nec	22	1.219	1.0	84	0.8	84
3825	Instruments to measure electricity	24	7.206	−0.4	115	−1.7	115
382A	Laboratory instruments (SIC 3821,26,27,29)	24	12.901	3.7	26	5.2	26
3828	Measuring and controlling inst. (SIC 3822-24)	24	9.86	1.5	70	6.0	70
3841	Surgical and medical instruments	46	10.325	8.6	3	7.3	3
3842	Surgical appliances and supplies	46	11.463	7.6	4	7.7	4
3843	Dental equipment and supplies	46	1.617	5.9	10	3.7	10
3844	X-ray apparatus and tubes	46	2.353	4.9	18	10.9	18
3845	Electromedical equipment	46	5.381	5.5	13	10.7	13
3861	Photographic equipment and supplies	25	21.273	−1.8	129	2.5	129
3911	Jewelry, precious metal	39	4.113	−3.0	149	0.2	149
3931	Musical instruments	39	0.693	−0.1	114	−3.9	114
3942	Dolls and stuffed toys	39	0.244	−2.0	135	−4.6	135
3944	Games, toys, and children's vehicles	39	3.425	−2.0	133	0.3	133
3949	Sporting and athletic goods, nec	39	5.326	−3.0	157	1.0	157
3961	Costume jewelry	39	1.46	−1.0	123	1.2	123

*Current Dollars

SOURCE: *U.S. Industrial Outlook* datafiles.

Industry Reviews and Forecasts

1

Metals and Industrial Minerals Mining

Mining is expected to remain virtually unchanged in 1991, reflecting softness in the economy generally and in the automobile and construction industries in particular. Metals and industrial minerals registered moderate production gains in 1990, but higher employment in metal mining was largely offset by a shrinkage in industrial minerals employment.

Before reading this chapter, please see "How to Get the Most Out of This Book" on page 1. It will clarify questions you may have concerning data collection procedures, factors affecting trade data, forecasting methodology, the use of data, sources and references, and the Standard Industrial Classification system (SIC). For other topics related to the subject of this chapter, see chapters 7 (Construction Materials) and 12 (Chemicals and Allied Products).

The domestic nonfuel minerals industry covered in this chapter includes mining of ores such as iron, copper, gold, silver, and zinc (SIC 10), and production of industrial minerals such as stone, sand and gravel, clays, phosphate rock, lime, salt, soda ash, and boron (SIC 14).

Total nonfuel minerals production in 1990 was estimated at $32.2 billion, a 5.4 percent increase over 1989. In current dollars, production of the 21 minerals that make up more than 95 percent of the industry's total increased in all but 3 of the last 30 years.

The metals component has fluctuated much more than the industrial minerals component, a reflection of the greater volatility of metal prices. Since 1961, the production value of metals declined in 7 years and increased in the other 23 years, including 6 percent increases in both 1989 and 1990.

A strike at Cleveland-Cliffs Company's Empire and Tilden iron ore mines in Michigan began August 1, 1990. The two mines account for 25 percent of U.S. production. A month earlier a strike began at Asarco's Ray copper mine in Arizona, but management and supervisory personnel maintained 90 percent of production.

There were few speculators in the copper market in 1990, and they were for the most part somewhat bearish. Consequently, prices were lower even though stocks of copper were smaller than in 1989. Gold prices were relatively weak for much of 1990, in part because of heavy selling by the Soviet Union, and some marginal U.S. gold producers were forced to shut down. But gold rebounded moderately in July, then soared temporarily after Iraq's invasion of Kuwait. Some gold mines reopened in response. Similarly, silver prices languished during the first half of 1990, then rose with the outbreak of the Mideast crisis. However, as the situation in the Persian Gulf stabilized in late August, gold and silver prices dropped sharply, giving back most of their earlier runup.

In contrast to metals, production of industrial minerals rose almost continuously from 1961 to 1990. The exception was a 14 percent decline in 1982. Production remained virtually unchanged in 1986 and 1989, and increased 5 percent in both 1988 and 1990.

Trading in minerals declined an estimated 3.2 percent in 1990. Metals made up about 60 percent of imports, with a value of $1.4 billion. Industrial minerals accounted for another $900 million in imports. Imports of iron and aluminum ores declined sharply. Metal exports of $1.25 billion accounted for three-fourths of raw mineral exports. Industrial minerals contributed $410 million. Copper exports declined significantly.

Employment

Employment in metal mining continued the increase that began in 1987. However, employment in industrial mineral mining declined slightly. As a result, overall employment increased only 1.1 percent, to 179,100. The number of production workers rose by 0.7 percent to 137,800, but

Trends and Forecasts: Metal and Industrial Mineral Mining (SIC 10,14)

(in millions of dollars except as noted)

Item	1987	1988	1989[1]	1990[2]	1991[3]	Percent Change 1987–88	1988–89	1989–90	1990–91
Industry Data									
Value of shipments[4]	26,346	30,022	30,590	32,233	—	14.0	1.9	5.4	—
Value of shipments (1987$)	26,346	29,057	28,429	28,500	28,361	10.3	−2.2	0.2	−0.5
Total employment (000)	154	164	177	179	—	6.5	7.9	1.1	—
Production workers (000)	118	126	137	138	—	6.6	8.7	0.7	—
Average hourly earnings ($)	11.25	11.68	12.13	12.36	—	3.8	3.9	1.9	—

[1] Data are preliminary.
[2] Estimate.
[3] Forecast.

[4] Value of all products and services sold by establishments in the metal and industrial mineral mining industry.

SOURCE: U.S. Department of the Interior, Bureau of Mines; U.S. Department of Labor, Bureau of Labor Statistics. Estimates and forecasts by the Bureau of Mines.

U.S. Exports and Imports
Metal and Industrial Mineral Mining

(in millions of dollars except as noted)

SIC	Industry	1989	1990[1]	1991[2]	Percent Change 1989-90	Percent Change 1990-91
	Metal and Industrial Mineral Mining					
	Value of exports	1,659	1,555	1,500	−6.3	−3.5
	Value of imports	2,326	2,303	2,300	−1.0	−0.1

[1] Estimate [2] Forecast

SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration. Estimates and forecasts by the Bureau of Mines.

declined slightly as a percentage of all employees, the result of increased use of labor-saving equipment and greater administrative and managerial needs.

Taken separately, total employment in industrial mineral mining decreased 2.0 percent to 113,000, while the number of production workers fell 3.0 percent to 85,300. By contrast, total employment in metal mining rose to 66,100 and the number of production workers rose to 52,500. Both numbers are 7 percent above 1989 and reflect continued high metal prices, which prompted some mines to expand and others to reopen.

Financial Situation

The metals and industrial minerals industry is approaching the end of one of its four-year cycles as the overall economic slowdown begins to erode profits. An annual industry review revealed that first-half 1990 profits of the metals and mining industry were 34 percent lower than in the same period a year earlier. The declines in the steel and aluminum industries were even steeper. However, market analysts predict a recovery for steel in 1991 or 1992.

Profits also tumbled in the nonferrous industries, falling as much as 36 percent below 1989. The aluminum industry was hard-hit by the slumps in autos and construction, two of the industry's largest consumers. Lower spot prices for copper hurt profits of copper companies. For the group as a whole, the value of industrial minerals production rose 5 percent. As with metals, performance was mixed. Higher 1990 prices enabled some segments to maintain their profit levels despite steady or falling demand.

U.S. Trade Patterns in 1989
Metal and Industrial Mineral Mining
SIC 10,14

(in millions of dollars, percent)

Exports	Value	Share	Imports	Value	Share
Canada & Mexico	421	25.4	Canada & Mexico	928	39.9
South America	73.8	4.4	South America	419	18.0
European Community	442	26.7	European Community	109	4.7
East Asia NICs	120	7.2	East Asia NICs	107	4.6
Japan	467	28.1	Japan	15.1	0.7
Other	135	8.2	Other	748	32.2
World Total	1,659	100.0	World Total	2,326	100.0
Top Five Countries					
	Value	Share		Value	Share
Japan	467	28.1	Canada	679	29.2
Canada	361	21.7	Mexico	249	10.7
Belgium	143	8.6	Venezuela	203	8.7
Netherlands	122	7.4	Australia	200	8.6
West Germany	83.0	5.0	Brazil	149	6.4

See "How to Get the Most Out of This Book" for definitions of the Country Groupings.

SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration.

Even if a recession hits, prices in the metals and industrial minerals industry are expected to hold. Profits may not be as high as company officials would like, but the industry probably can maintain its profitability in the face of an economic downturn.

Two areas of concern for metals and minerals producers are a carbon tax and a tax on virgin materials, either one or both of which Congress may turn to as a source of revenue and to encourage recycling.

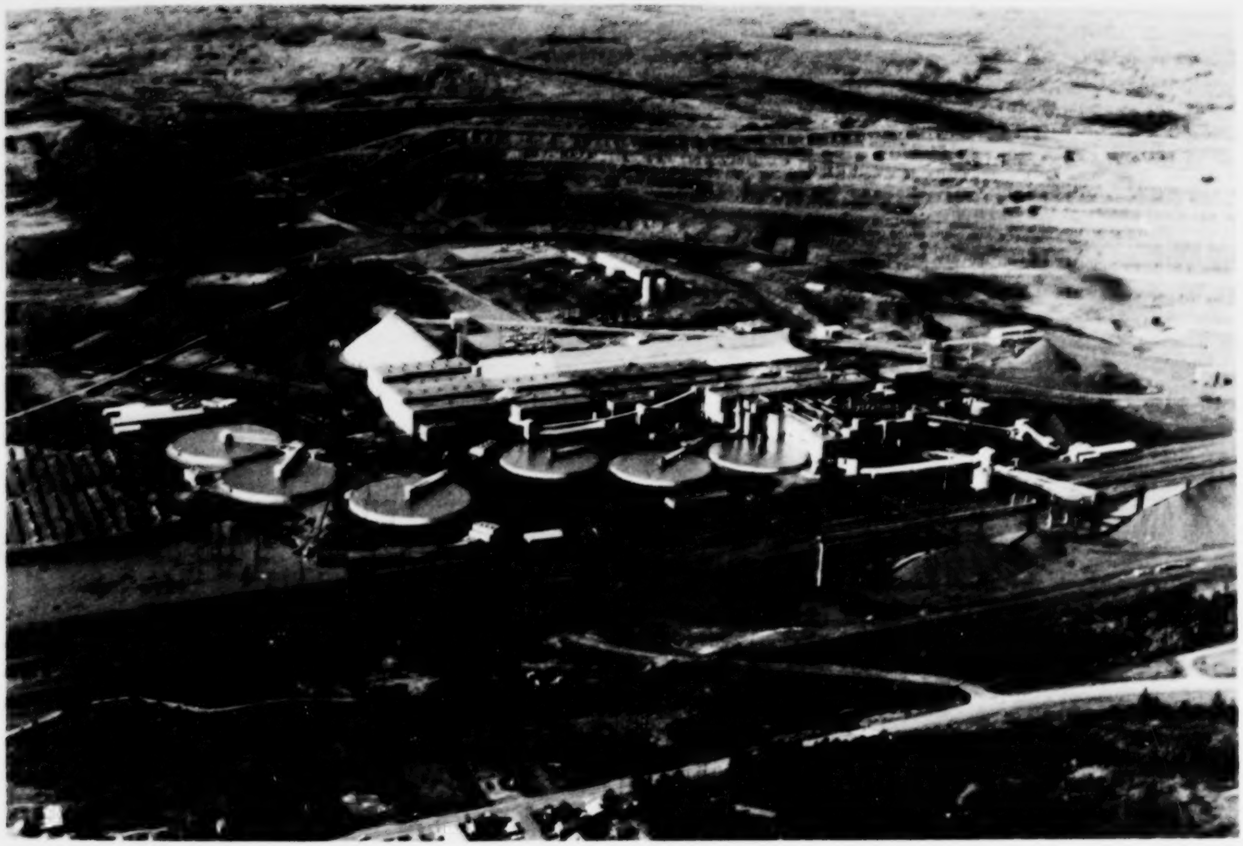
Government Regulations

The control and cleanup of mining and minerals processing wastes occupies a foremost place in the attention of Federal agencies and industry representatives. At issue since the promulgation of regulations to govern the management of hazardous wastes under Subtitle C of the 1987 Resource Conservation and Recovery Act (RCRA), has been whether mining waste should be regulated like other kinds of industrial hazardous wastes, whether they should be treated as "special wastes" under new Subtitle C rules, or whether they should be regulated separately under Subtitle D rules for non-hazardous solid waste management.

The mining industry generates more than 1 billion metric tons of waste per year, compared with 260 million tons generated by all hazardous waste industries combined. The average mining waste facility manages about 3 million tons of waste per year, compared with about 50,000 tons at hazardous waste facilities. In addition, mine waste piles take up an average of 126 acres, and tailings impoundments take up an average of 500 acres. Industrial hazardous waste impoundments, by contrast, take up an average of about 6 acres, and landfills about 10 acres. On the other hand, mine waste poses less risk of environmental damage and danger to human health. That is because mines are generally in areas of the country where the climate is drier, such as the Southwest, thus lessening the potential for leaching contaminants into groundwater. In addition, mining operations typically are in less densely populated areas than industrial waste sites. The question of how mining wastes should be regulated will likely be resolved when Congress takes up reauthorization of RCRA sometime in 1991.

Health and safety regulations also will be an important topic in 1991, with special attention focused on a proposed reduction of the permissible exposure limit (PEL) for cadmium. In February 1990, the Occupational Safety and Health Administration (OSHA) proposed to reduce the existing PEL of 100 micrograms per cubic meter for fumes and 200 micrograms per cubic meter for dust to two 8-hour time-weighted exposure limits of either 5 or 1 micrograms per cubic meter. Both the producing and consuming sectors of the cadmium industry consider this unfeasible and far more stringent than necessary to prevent material impairment of worker health. Furthermore, because cadmium is a by-product of zinc, lead, and copper ores—and sometimes recovered—the impact on these industries could be severe.

Concern over pollution of the environment continues to have global implications which, in turn, affect national policy. For example, the Environmental Protection Agency (EPA) is now drafting legislation to implement the Basel Convention, an international agreement among 56 coun-



American Mining Congress

Cleveland-Cliffs' Empire iron ore mine in Michigan. Congress is expected to regulate mining wastes in 1991.

tries to regulate the transportation of hazardous wastes across borders. Under the agreement, hazardous wastes are required to be handled in an environmentally sound manner, regardless of the nation in which the disposal takes place, and requires governments to prohibit exports of hazardous wastes unless they can be sure the wastes will be properly handled and disposed of in the nation that receives them. On the surface this appears to be a reasonable approach to a significant issue. However, the Basel Convention does not make special provision for recyclable materials, which is of particular concern to the scrap metal recycling industry.

The agreement defines hazardous waste as any material that contains lead, cadmium, antimony, arsenic, selenium, tellurium, mercury, thallium, and beryllium. In addition, hazardous wastes can be defined by either the originating or receiving nation. Subjecting all metal wastes and scrap to the Basel Convention requirements could prove costly and disruptive to trade in the minerals industries.

Federal Lands

Besides economic factors, the outlook for minerals is affected by pressure from environmentalists to withdraw Federal land from mutiple use, which includes mining. To the extent that potentially mineral-rich areas are closed to exploration and production, U.S. dependence on foreign sources could increase. Moreover, pressure to convert land already designated as multiple use to wilderness or game refuges tends to reduce the industry's incentive for mineral development.

Currently, nearly 34 million acres of forest lands are officially designated as wilderness. In addition, 23 areas in Alaska's Tongass National Forest are being considered for wilderness designation, which together would remove approximately 1.8 million acres of the Nation's largest national forest from mineral exploration and development.

Table 1: Availability of Federal Land for Mineral Exploration and Development

(in millions of acres)

State	Available		Slightly to Moderately Restricted		Unavailable To Severely Restricted		Total
	Acres	Percent	Acres	Percent	Acres	Percent	Acres
Arizona	16.5	52	3.2	10	12.3	38	32.0
Colorado	12.0	48	6.1	25	6.7	27	24.8
Nevada	42.5	70	2.5	4	15.6	26	60.6
New Mexico	22.2	69	2.2	7	7.9	24	32.3
Oregon	22.7	70	3.7	11	5.9	19	32.3
Washington	5.0	38	1.0	8	7.0	54	13.0
Utah	19.7	55	5.1	14	11.0	31	35.8
Idaho	13.6	39	8.8	25	12.3	35	34.7
Subtotal	154.2	58	32.6	12	78.7	30	265.5
Alaska	39.4	15	7.3	3	208.7	82	255.4
Total	193.6	37	39.9	8	287.4	55	520.9

SOURCE: U.S. Department of the Interior, Bureau of Mines, Special Publications.

Congressional bills are also pending that would designate Bureau of Land Management (BLM) wilderness areas in the California Desert, Arizona, and Utah. In California, pending state legislation would give preservation status to 10.4 million acres of the 25-million-acre California Desert Conservation Area (CDCA) in southern California, including 4.3 million acres of BLM-managed lands already designated as wilderness. Wilderness designation closes an area to all motorized vehicles and commercial use. The CDCA is one of the most diverse geologic regions and mineralized areas of the United States, with known occurrences of more than 45 mineral commodities.

BLM is currently considering wilderness recommendations on 24 million acres of land. Final recommendations are due to the President by 1991.

In 1983, the Bureau of Mines initiated an assessment of Federal lands, known as Inventory of Land Use Restraints Program (ILURP). Studies have since been completed of lands in Arizona, Colorado, Nevada, New Mexico, Oregon, Washington, Utah, and Idaho; for six regions in Alaska, and the California Desert Conservation Area (CDCA). Studies for Wyoming and Montana are now under way, and a study of California is scheduled to be finished after fiscal 1990.

The availability of Federal lands for exploration in various states is shown in Table 1. For a more detailed discussion of federal land management, see *1990 U.S. Industrial Outlook,* Chapter 1, (Metals and Industrial Minerals Mining).

Defense Production

The underlying legislation for defense preparedness measures in basic industry was the Defense Production Act (DPAct), which was passed in September of 1950 to facilitate the mobilization of America's resources in support of the Korean War. The DPAct was in effect through October 20, 1990. However, the act was allowed to expire when Congress became immersed in the budget process during the fall of 1990. Consequently, the legal basis for filling defense orders on a priority basis reverted to the Selective Service Act of 1967, still in effect.

National Defense Stockpile

Another law that provides authority for defense readiness is the Strategic and Critical Materials Stock Piling Act of 1939, as amended in 1946 and 1979. Stockpile goals and inventories are listed in Table 2.

Primary efforts to restructure the stockpile included the upgrading of chromium and manganese ores into ferroalloys and the upgrading of bauxite into aluminum. Disposals of excesses involved nine materials: diamond bort, mercury, phlogopite mica splittings, quartz crystals, silicon carbide, thorium nitrate, tin, and the vegetable tannins chestnut and quebracho. These disposals were used largely as exchange payment in support of a congressionally mandated ferroalloys upgrading program. The Defense Logistics Agency of the Department of Defense also sold 4,100 flasks of mercury from old Atomic Energy Commission (now Department of Energy) stocks and over 2.5 million troy ounces of silver from Treasury Department stocks. In addition, more than 6.1 million troy ounces of excess stockpile silver were transferred to the Treasury for use in coinage.

For more information about the Defense Production Act and the National Defense Stockpile, see *1990 Industrial Outlook,* Chapter 1, (Metals and Industrial Minerals Mining).

Table 2: Department of Defense Stockpile Goals, and Inventories (as of August 31, 1990)

	Goal		Inventory
Aluminum metal group	7,150,000	ST Al	
(Alumina)	0		0
(Aluminum)	700,000	ST	2,082
(Bauxite, metal grade, Jamaica type)	21,000,000	LDT	12,457,740
(Bauxite, metal grade, Surinam type)	6,100,000	LDT	5,299,597
Aluminum oxide, abrasive grain group	374,000	ST Ab	
(Aluminum oxide, abrasive grain)	0	ST	50,904
(Aluminum oxide, fused, crude)	0	ST	249,867
(Bauxite, abrasive grade)	1,000,000	LCT	0
Antimony	88,500	ST	36,006
Asbestos, amosite	17,000	ST	34,006
Asbestos, chrysotile	3,000	ST	10,703
Bauxite, refractory	1,240,000	LCT	274,638
Beryllium metal group	2,440,000	LB Be	
(Beryl Ore 11% BeO)	36,000,000	LB	35,522,000
(Beryllium copper master alloy)	15,800,000	LB	14,774,000
(Beryllium metal)	800,000	LB	630,000
Bismuth	1,060,000	LB	2,016,355
Cadmium	11,700,000	LB	6,328,570
Chromium, chemical & metallurgical group	1,353,000	ST Cr	
(Chromite, chemical grade ore)	675,000	SDT	242,414
(Chromite, metallurgical grade ore)	3,200,000	SDT	1,646,318
(Chromium, ferro, high carbon)	185,000	ST	641,185
(Chromium, ferro, low carbon)	75,000	ST	318,693
(Chromium, ferro, silicon)	90,000	ST	58,357
(Chromium, metal)	20,000	ST	3,763
Chromite, refractory grade ore	695,000	SDT	391,414
Cobalt	85,400,000	LB Co	52,778,142
Columbium group	12,520,000	LB Cb	
(Columbium carbide powder)	100,000	LB Cb	
(Columbium concentrates)	5,600,000	LB Cb	2,019,217
(Columbium, ferro)	0	LB Cb	930,911
(Columbium, metal)	0	LB Cb	44,851
Copper	1,000,000	ST	29,047
Cordage fibers, abaca	155,000,000	LB	0
Cordage fibers, sisal	60,000,000	LB	0
Diamond, industrial group	7,730,000	KT	
(Diamond dies, small)	60,000	PC	25,473
(Diamond, industrial, crushing bort)	22,000,000	KT	19,020,961
(Diamond, industrial, stones)	7,700,000	KT	7,777,225
Fluorspar, acid grade	900,000	SDT	892,856
Fluorspar, metallurgical grade	310,000	SDT	410,822
Germanium	146,000	KG	48,199
Graphite, natural—ceylon, amorphous lump	6,300	ST	5,492
Graphite, natural—malagasy, crystalline	14,200	ST	17,766
Graphite, natural—other than above	1,930	ST	2,803
Indium	1,350,000	TrOz	
Iodine	5,800,000	LB	6,067,973
Jewel bearings	120,000,000	PC	78,221,318
Lead	1,100,000	ST	601,053
Manganese dioxide, battery grade group	50,000	SDT	
(Manganese, battery grade, natural ore)	25,000	SDT	202,936
(Manganese, battery grade, synthetic dioxide)	25,000	SDT	3,011
Manganese, chemical & metallurgical group	1,500,000	ST Mn	
(Manganese ore, chemical grade)	170,000	SDT	172,744
(Manganese ore, metallurgical grade)	2,700,000	SDT	2,774,231
(Manganese, ferro, high carbon)	439,000	ST	812,157
(Manganese, ferro, low carbon)	0	ST	0
(Manganese, Ferro, medium carbon)	0	ST	29,057
(Manganese, ferro, silicon)	0	ST	23,574
(Manganese, metal, electrolytic)	0	ST	14,172
Mercury	10,500	Flasks	158,356
Mica, muscovite, block, stained & better	2,500,000	LB	5,212,447
Mica, muscovite film, 1st & 2nd qualities	90,000	LB	1,176,338
Mica, muscovite splittings	12,630,000	LB	14,390,845
Mica, phlogopite block	210,000	LB	130,745
Mica, phlogopite splittings	930,000	LB	1,496,867
Molybdenum group	0		0
Morphine sulphate and related analgesics	130,000	AMA LB	
(Crude)	0	AMA LB	31,795
(Refined)	130,000	AMA LB	39,508
Natural insulation fibers	0	LB	0
Nickel	200,000	ST	37,214
Platinum group metals, iridium	86,000	TrOz	29,590
Platinum group metals, palladium	2,150,000	TrOz	1,264,601
Platinum group metals, platinum	1,310,000	TrOz	452,641
Platinum group metals, rhodium	30,000	TrOz	*
Platinum group metals, ruthenium	65,000	TrOz	*
Pyrethrum	500,000	LB	0
Quartz crystals	240,000	LB	1,610,737
Quinidine	10,100,000	AvOz	2,473,050

Quinine	4,500,000	AvOz	3,246,065
Rayon (aerospace grade fiber)	3,000,000	LB	*
Ricinoleic/sebacic acid products	8,800,000	LB	5,009,697
Rubber	850,000	LT	125,432
Rutile	106,000	SDT	39,186
Sapphire & ruby	0	KT	16,305,502
Silicon carbide, crude	29,000	ST	53,348
Silver (fine)	0	TrOz	92,960,616
Talc, steatite block & lump	0	ST	1,081
Tantalum group	7,160,000	LB Ta	
(Tantalum carbide powder)	0	LB Ta	28,688
(Tantalum metal)	0	LB Ta	201,133
(Tantalum minerals)	8,400,000	LB Ta	2,837,943
Thorium nitrate	600,000	LB	7,097,687
Tin	42,674	MT	169,532
Titanium sponge	195,000	ST	36,831
Tungsten group	70,900,000	LB W	
(Tungsten carbide Powder)	2,000,000	LB W	2,032,942
(Tungsten, ferro)	0	LB W	2,024,143
(Tungsten, metal powder)	1,600,000	LB W	1,898,831
(Tungsten ores & concentrates)	55,450,000	LB W	76,356,308
Vanadium group	8,700	ST V	
(Vanadium, ferro)	1,000	ST V	0
(Vanadium pentoxide)	7,700	ST V	721
Vegetable tannin extract, chestnut	5,000	LT	11,690
Vegetable tannin extract, quebracho	28,000	LT	
Vegetable tannin extract, wattle	15,000	LT	14,998
Zinc	1,425,000	ST	378,760

* Added 1 June 1989 with interim requirements

SOURCE: U.S. Department of Defense and Department of the Interior, Bureau of Mines.

Outlook for 1991

The likelihood of higher fuel prices and a slowing economy will increase the cost of metal and mineral production and lessen demand. In particular, lower car sales and a shift to smaller, more fuel-efficient cars would hurt the industry.

Two other pending developments are the economic integration of Western Europe in 1992 and the emergence of the Eastern European nations as market economies. The 12 European Community members are already gearing up to compete with other world markets. U.S. mining companies will try to increase their ties with Western Europe in an attempt to gain a foothold. In the case of Eastern Europe, however, mining companies can be expected to proceed much more gradually. Although the market for minerals is potentially large, the East Europeans have limited ability to pay for imports.

Mining companies will continue to enter joint ventures as a way to reduce costs. New mining operations will face more and stricter environmental hurdles than ever before. Typically, a large mining project takes 10 years and requires the expenditure of tens of millions of dollars before generating income.

Long-Term Prospects

The trend toward joint ventures is likely to accelerate. The number and scope of environmental studies required for new mining operations will continue to increase, further delaying the time between exploration and the commencement of mining, and increasing costs in the process.

Both the European economic unification and the United States-Canada free trade agreement offer mining companies opportunities for new markets. At the same time, however, international competition will increase to new levels as more and more companies operate worldwide and adopt global strategies.—*Barry W. Klein, Annette P. Graham, Donald Barnes, Luis Coppa, Division of Policy Analysis, Bureau of Mines, U.S. Department of the Interior, (202) 634-1036, September 1990.*

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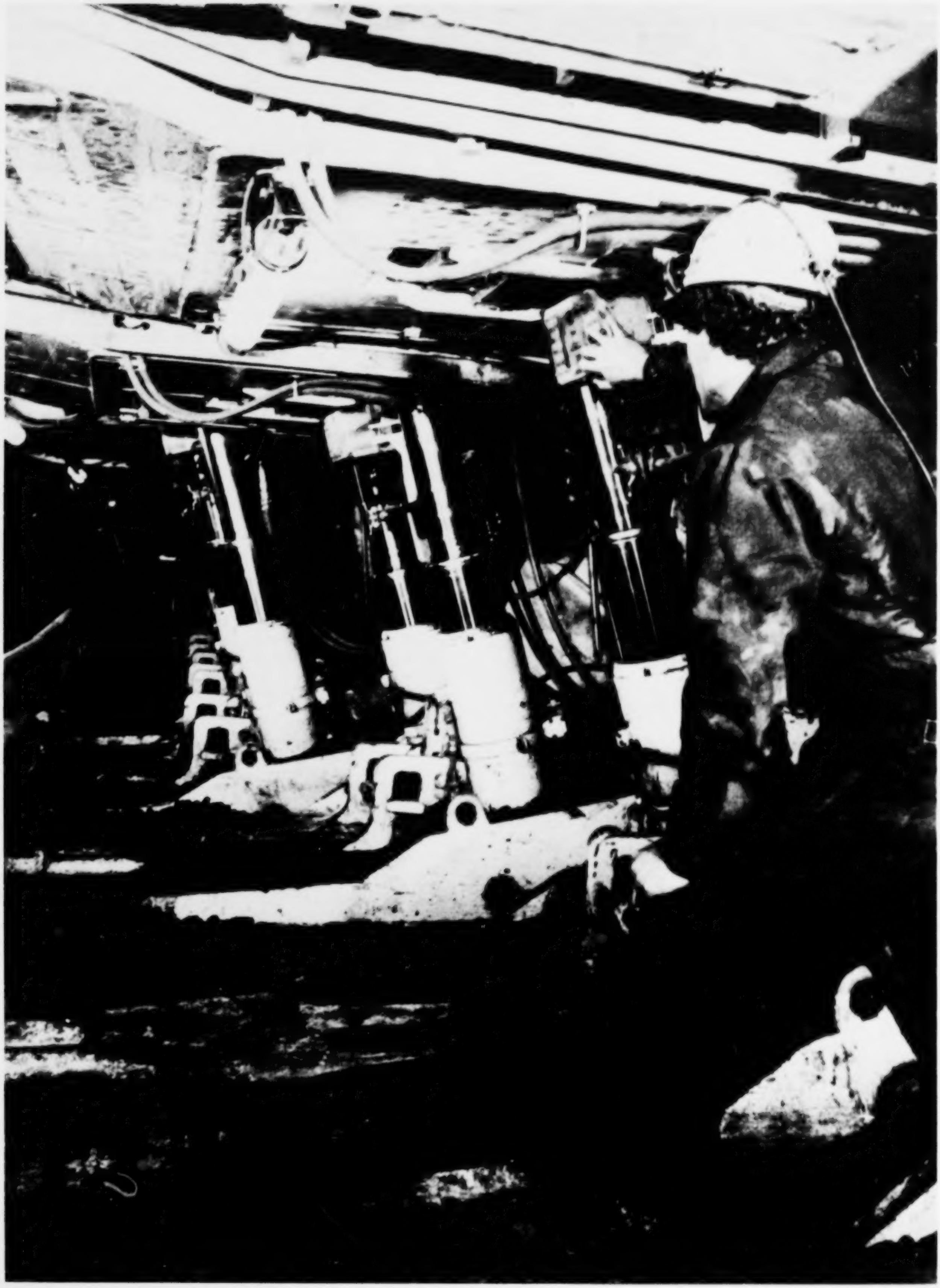

2

Coal Mining

Production of coal in the United States is expected to set another record in 1991, exceeding 1 billion short tons. Aggregate coal consumption will rise, led by a 5-percent increase in the quantity of coal burned by electric utilities. For the period 1990 through 1995, coal production should rise at an annual rate of about 1.5 percent, with virtually all of the growth coming from increasing electric utility demand.

This industry is composed of establishments primarily engaged in producing or developing bituminous coal or lignite at surface mines (SIC 1221), bituminous coal or lignite at underground mines (SIC 1222), or anthracite coal (SIC 1231). The industry includes auger mining, strip mining, culm bank mining, and other surface mining, as well as coal preparation plants engaged in cleaning, crushing, screening, or sizing. It also includes establishments primarily engaged in performing coal mining services for others on a contract or fee basis (SIC 1241). All tonnages reported in this chapter are in short tons.

The U.S. coal industry is being transformed by improved technology. The increasing use of underground "longwall" and other continuous mining techniques and development of large surface mines continues to reduce industry costs. Despite a steady decline in the relative price of coal (Table 1), production has risen by 11 percent since 1987 (Table 2), and labor productivity has also been rising rapidly.

Electric utilities account for nearly 90 percent of U.S. coal consumption (Table 3). Some 57 percent of U.S. electric power is generated through coal. Most of the rest of U.S. coal production is exported, burned as industrial boiler fuel, or used to make coke for the iron and steel industry.

Table 1: Producer Prices for Coal[1], 1987-91

(dollars)

Year	Per Ton		Per Million BTU	
	Current	Constant[2]	Current	Constant[2]
1987	23.00	19.59	1.05	0.89
1988	22.00	18.14	1.01	0.83
1989	21.00	16.63	0.96	0.76
1990[3]	21.14	NA	0.97	NA

[1] Average price of bituminous coal, sub-bituminous coal, and lignite, based upon free on board (f.o.b.) mine value.

[2] Actual price divided by GNP deflator (1982=100).

[3] Estimate.

NA=Not available.

SOURCE: U.S. Department of Energy, Energy Information Administration.

Table 2: U.S. Coal Overview, 1987-91

(in million tons)

Year	Production	Stock[1] Changes	Imports	Exports	Total Consumption
1987	918.8	-4.0	1.7	79.6	836.9
1988	950.3	26.3	2.1	95.0	883.7
1989	979.6	7.8	2.9	100.8	889.5
1990[2]	1022.0	-33.0	3.0	100.0	892.0
1991[3]	1035.0	-9.0	3.0	101.0	928.0

[1] Includes losses and statistical discrepancies. Net withdrawals from stocks are considered positive numbers.

[2] Estimate.

[3] Forecast.

SOURCE: U.S. Department of Energy, Energy Information Administration.

The delivered price of coal varies considerably around the United States, depending on transport costs, the energy content of the coal per unit weight, and its sulfur content. When burned, the sulfur in coal produces pollutant sulfur dioxide gas, one of the key precursors of acid rain. Power plants built since 1978 are strictly limited in the amount of sulfur dioxide they may emit, and consequently must have costly flue gas desulfurizers (sometimes called "scrubbers") installed. Coal with a sufficiently low sulfur content to comply with emission limits (1.2 pounds of sulfur per million British thermal units of energy content) commands a premium price and has been dubbed "compliance coal."

Trends and Forecasts: Coal Mining (SIC 12)

(in millions of dollars except as noted)

Item	1987	1988	1989	1990[1]	1991[2]	Percent Change			
						1987-88	1988-89	1989-90	1990-91
Industry Data									
Value of shipments[3]	21,292	20,903	20,652	21,696	—	-1.8	-1.2	5.1	—
Value of shipments (1987$)	21,292	21,833	22,604	22,568	23,870	2.5	3.5	-0.2	5.8
Total employment (000)	163	—	—	—	—	—	—	—	—
Production workers (000)	129	—	—	—	—	—	—	—	—
Average hourly earnings ($)	16.37	—	—	—	—	—	—	—	—
Product Data									
Value of shipments[4]	21,292	20,903	20,652	21,696	—	-1.8	-1.2	5.1	—
Value of shipments (1987$)	21,292	21,833	22,604	22,568	23,870	2.5	3.5	-0.2	5.8

[1] Estimate.

[2] Forecast.

[3] Limited to value shown below for product data.

[4] Value of products classified in the coal mining industry produced by all industries.

SOURCE: U.S. Department of Commerce: Bureau of the Census, International Trade Administration; and U.S. Department of Energy, Energy Information Administration (EIA). Estimates and forecasts by EIA.

Table 3: U.S. Coal Consumption by End Use Sector, 1987–91

(in million tons)

Year	Electric Utilities	Coke Plants	Other Industrial and Transportation	Residential and Commercial	Total
1987	717.9	37.0	75.2	6.9	836.9
1988	758.4	41.9	76.3	7.1	883.7
1989	765.8	41.4	76.1	6.2	889.5
1990[1]	773.0	38.0	81.0[2]	([3])	892.0
1991[4]	808.0	39.0	80.0[2]	([3])	928.0

[1] Estimate.

[2] Other industrial, transportation, residential, and commercial consumption are combined in the estimated and forecast years.

[3] Included in "Other Industrial and Transportation."

[4] Forecast.

NOTE: Totals may not equal sum of components due to independent rounding.

SOURCE: U.S. Department of Energy, Energy Information Administration.

U.S. coal is produced in 27 of the 50 states, in about 2,900 mines. However, 72 percent of U.S. production comes from 349 large mines, each with an annual capacity greater than 0.5 million tons per year. About half of U.S. coal is produced in three states: Kentucky, Wyoming, and West Virginia.

Most of the recent growth in U.S. coal production has come from west of the Mississippi. While output from mines east of the Mississippi has increased only fractionally since 1980, output west of the Mississippi has risen 48 percent and now accounts for nearly 40 percent of U.S. production. Western coal is usually low sulfur, low-energy content coal, which is surface mined on a large scale. Western coal is making increasing inroads in utility markets east of the Mississippi.

Coal industry profitability has risen, even as prices have fallen. Large scale surface mines and underground mines using continuous mining techniques have been gaining market share at the expense of smaller mines using older techniques. The results of this phenomenon can be seen in Table 4: rising labor productivity; a steady decline in the total number of mines in operation; declining industry employment.

The profitability of about half of the coal industry can be observed by examining the financial statements of publicly-traded firms. This sample is, of course, heavily biased toward larger operators. Publicly-traded firms account for about 55 percent of U.S. coal production. Major petroleum companies account for about 30 percent of U. S. coal production. For the publicly-traded firms, profits declined in 1989, primarily due to the effects of the United Mine Workers strike against the Pittston Corp. Excluding Pittston's results, the rest of the industry's profits increased marginally.

Table 4: Other Coal Industry Indicators, 1981–1988

(bituminous coal and lignite only)

Year	Number of Mines[1]	Number of Workers[2]	Productivity (tons per miner per hour)	Productivity Growth (percent)
1981	4,140	229,302	2.10	8.3
1982	4,098	217,117	2.11	0.5
1983	3,405	175,642	2.50	18.5
1984	3,566	177,848	2.64	5.6
1985	3,355	169,281	2.74	3.8
1986	3,175	154,645	3.01	9.9
1987	3,030	142,667	3.30	9.6
1988	2,915	135,366	3.55	7.6

[1] Excludes mines producing less than 10,000 tons in the year, and silt, culm, refuse bank, slurry dam, and dredge production.

[2] Average number of workers working daily: includes all employees engaged in production, preparation, processing, development, maintenance, and repair, shop, or yard work at mining operations, as well as mining operations management and all technical and engineering personnel. Excludes office workers.

SOURCE: U.S. Department of Energy, Energy Information Administration.

Capital expenditures for publicly-traded coal companies rose 55 percent in 1989, suggesting that further growth in production and/or productivity is likely.

INTERNATIONAL COMPETITIVENESS

Coal exports total about 100 million tons per year, about 10 percent of U.S. production. While metallurgical coal accounts for less than 10 percent of total coal production, it amounts to more than half of U.S. coal exports. U.S. metallurgical coal is sold primarily to steel companies in Europe, Japan, Korea, and Brazil.

U.S. Exports and Imports
Coal Mining

(in millions of dollars except as noted)

SIC	Industry	1989	1990[1]	1991[2]	Percent Change 1989-90	Percent Change 1990-91
12	COAL MINING					
	Value of exports	4,287	4,283	4,416	−0.1	3.1
	Value of imports	97.3	101	104	3.8	3.0

[1] Estimate.

[2] Forecast.

SOURCE: U.S. Department of Commerce: Bureau of the Census, International Trade Administration (ITA). Estimates and forecasts by ITA.

Steam coal exports expanded in both 1989 and 1990. Steam coal is primarily used as boiler fuel in Western Europe, Canada, Taiwan, and Japan. Most U.S. export coal is produced in Appalachia and exported via Baltimore, Maryland, and Hampton Roads, Virginia. U.S. coal exports compete with foreign oil and gas, and with exports from other major coal exporters (Australia, South Africa, U.S.S.R., and Poland). During 1989, declining Polish and Soviet coal exports created an unexpected opportunity for U.S. coal exports, one that American producers were able to exploit.

The United States also imports almost 3 million tons of coal per year. U.S. utilities in the Southeast import coal for coastal power stations, because waterborne transport is less

U.S. Trade Patterns in 1989
Coal Mining
SIC 12

(in millions of dollars, percent)

Exports	Value	Share	Imports	Value	Share
Canada & Mexico	718	16.7	Canada & Mexico	32.6	33.5
South America	323	7.5	South America	59.5	61.1
European Community	1,167	27.2	European Community	0.5	0.5
East Asia NICs	342	8.0	East Asia NICs	3.5	3.6
Japan	595	13.9	Japan	0.0	0.0
Other	1,142	26.6	Other	1.2	1.2
World Total	4,287	100.0	World Total	97.3	100.0

Top Five Countries

	Value	Share		Value	Share
Canada	715	16.7	Colombia	47.5	48.8
Japan	595	13.9	Canada	30.8	31.7
Italy	490	11.4	Venezuela	11.9	12.3
Belgium	309	7.2	China	3.5	3.6
France	269	6.3	Mexico	1.8	1.8

See "How to Get the Most Out of This Book" for definitions of the Country Groupings.

SOURCE: U.S. Department of Commerce: Bureau of the Census, International Trade Administration (ITA).

expensive in these areas than transport from U.S. coal mining regions.

In 1988, foreign-affiliated U. S. coal producers accounted for 21 percent of U. S. production. During 1990, the British conglomerate, Hanson Industries, purchased the largest coal company in the United States, Peabody Holdings. Peabody produces about 9 percent (87 million tons) of U.S. coal. Other foreign owners of U.S. coal mining ventures include the Royal Dutch/Shell Group (Shell Mining), and the British construction firm, Costain, Ltd. (Costain Coal, formerly Pyro Energy).

U.S. ownership of foreign coal production is limited. The most important foreign holdings include Exxon Coal's interests in Colombia's export-oriented Cerrejon project and other Exxon properties in Australia and Canada. Arco Coal also maintains interests in Australia.

Outlook for 1991

Growth in coal use by electric utilities was slow in 1990 because of relatively mild weather, improved availability of hydro and nuclear power, and slower economic growth. But purchases by electric utilities rose rapidly in the first half of the year as they rebuilt stocks depleted by the Pittston strike in 1989 and the severe cold of December, 1989. Coal stockpiling, however, is likely to taper off in the second half of the year.

With a return to more normal weather patterns, rising electricity demand and higher prices for alternative fuels, electric utilities are expected to use 5 percent more coal in 1991.

Consumption of metallurgical coal by the iron and steel industry is expected to grow modestly, while coal consumption for industrial, commercial, and residential use is expected to show no growth or to decline slightly.

Coal exports are expected to remain at about the same level in 1991 as they were in 1989 and 1990: approximately 100 million tons. Declining metallurgical coal exports will be offset by stronger steam coal exports. Coal imports are also expected to continue at close to current levels.

Coal production is expected to continue to increase by slightly more than 1 percent in 1991, again exceeding 1 billion tons.

Long-Term Prospects

The growth in utility demand for coal is expected to be slower in the next 5 years than it has been in the past 5 years. In the near term, natural gas will command an increasing market share in the electric utility industry. In absolute terms, however, coal consumption will continue to rise as new coal-fired plants come on line and existing plant and equipment are used more intensively.

Consumption of coal by coke plants is limited by the capacity of existing coking plants. Because the construction

U.S. coal production is expected to increase by 1.5 percent a year through 1995.

of additional plants is unlikely, U.S. metallurgical coal use will probably remain roughly constant over the next 5 years.

Industrial consumption of coal will continue to increase at about the same rate as overall industrial energy demand. Coal will likely continue to maintain its current market share.

Coal exports, however, are expected to grow only marginally in the next few years because of oversupply in the world market. Moreover, increased output of Australian coal will probably reduce U.S. exports to the Far East.

The medium-term future of U.S. coal, therefore, is likely to be marked by stable prices and increasing output. U.S. coal production is expected to increase by 1.5 percent a year through 1995, with the most rapid growth concentrated in low-sulfur Western coal and the slowest growth in high-sulfur Midwest output.

This forecast for the future of coal is subject to several major uncertainties. In the following sections, these major uncertainties will be examined in more detail.

Rising Oil Prices

At the present time, a prolonged period of higher oil prices appears likely. For this reason, it is useful to consider the impact of higher oil prices on the U.S. coal industry.

As previously noted, the coal industry's principal customer is the electric utility industry. Utilities use oil to generate only about 6 percent of total electricity. In general, where it is possible for utilities to conveniently switch from oil to coal they have already done so. Consequently, a large switch from oil to coal is unlikely.

On the other hand, demand for electric power is closely linked to overall economic growth: recession or slower growth induced by higher oil prices will tend to reduce demand for electricity, and hence for coal.

Transportation costs frequently make up a large portion of the delivered cost of coal, and oil is the main fuel in the U.S. transportation sector. Coal mining itself uses a plethora of diesel-powered machines. In 1987, use of petroleum products in coal mining (not including transportation) accounted for about 1.5 percent of the industry's total value of shipments. Thus, any increase in oil prices will also tend to increase the delivered cost of coal. The impact is not very large: a 50 percent increase in oil prices might yield an increase in coal costs of less than 5 percent.

Finally, it should also be noted that while there is relatively little prospect for switching between oil and coal in U.S. markets, prospects are better in foreign markets, where U.S. coal has been a relatively expensive and marginal fuel source. Hence, higher oil prices may increase U.S. coal exports.

On balance, it is likely that fuel switching and higher coal exports will be partially offset by higher costs and weakness in coal's principal market: U.S. electric utilities.

The Clean Air Act Amendments

Congress has been considering amendments to the Clean Air Act since 1989. Differing versions of the law have been passed by the House and Senate. A mutually acceptable bill is expected to be passed in the near future. However, the exact form of the bill remains uncertain. The most important amendments for the coal industry are those sections dealing with acid precipitation and air toxics.

When burned, coal produces the pollutant sulfur dioxide (and related sulfur compounds). Power plants built since 1978 are required to have scrubbers. This law has led to a steady reduction in sulfur emissions since the late 1970s. However, more than 100 large coal-fired power plants built prior to 1978 continue to operate and to emit large volumes of sulfur into the atmosphere.

The intent of this section of the proposed Clean Air Act amendments is to control emissions at these plants by requiring phased reductions in allowable emissions at each plant. This is done by setting a maximum allowable level of emissions and then reducing the level over time. Plant operators are permitted to trade emissions allowances so that one plant may produce emissions that are higher than the allowable level so long as some other plant reduces emissions below the allowable level by the same amount. Plant operators are given discretion on how to achieve the reduction: they may install scrubbers, switch to low-sulfur coal, install advanced technology boilers, blend various coals or blend coal with natural gas, or even close the plant.

The versions of the bill differ on the precise scope for emissions trading. They also differ on the degree of discretion in choosing control technologies offered to utility operators.

Several studies have been done on potential industry reactions to the Clean Air Act amendments. They tend to suggest that utilities would build scrubbers on half of their affected capacity. About 30 percent of affected capacity would be switched to low-sulfur coal, and the balance would be switched to other fuels or use advanced technologies. About 100 million tons of coal consumption would switch from high-sulfur coal to low-sulfur coal. Low-sulfur coal accounts for about a third of utility coal consumption.

The impact of the Clean Air Act amendments will be highly concentrated in those areas that burn high-sulfur coal in older power plants. According to one estimate, five states (Indiana, Missouri, Ohio, Pennsylvania, and Tennessee) will bear 44 percent of the cost of the bill, and 15 Midwest and Eastern states will bear 86 percent of the cost. However, costs are uncertain, partly because the bill is not yet final and partly because neither the plans of utilities nor the amount of low-sulfur coal available are known with precision. Further, the extent to which emissions trading will actually occur is unknown. Depending on the assumptions chosen, the range of estimated costs is from $2 billion to $7 billion per year. The more emissions trading occurs, the less costly the legislation. The costs will be borne by high-sulfur coal producers, coal-burning utilities, and their customers.

Overall, however, while low-sulfur coal prices would rise, high-sulfur coal prices would decline, tending to leave national average coal prices little changed. Similarly, newer coal-fired power plants equipped with scrubbers would experience windfall benefits, because the price of high sulfur coal would fall.

The air toxics provisions of the proposed Clean Air Act amendments are considerably more uncertain in their effects than the acid precipitation provisions. The provisions establish an official list of proscribed chemicals, including poisonous metals such as lead and known carcinogens. Facilities emitting substantial volumes of the listed chemicals would be required to reduce emissions using an undefined "maximum available control technology." Subsequently, the

Environmental Protection Agency would evaluate the residual risk to health from remaining emissions and determine whether additional controls would be required. The level of residual risk deemed acceptable is not uniformly defined in the various versions of the bill.

The air toxics provision is aimed primarily at the chemical industry, but it may have effects on the electric utility and coal industries as well. Coal-and oil-fired boilers generate a number of listed compounds as particulate emissions. Improved control of particulate emissions may be required to enable most oil- and coal-fired power plants to comply with the new law.

In addition, all coke ovens in the United States will either require modification, rebuilding, or have to be closed, depending on the level of residual risk found acceptable. In the worst case, U.S. coke manufacture would cease and all coke would have to be imported, at considerable additional cost to the already troubled U.S. steel industry. U.S. exports of metallurgical coal would rise and export prices would fall.

Global Climate Change

Another important environmental issue is potential global climate changes caused by emissions of so-called greenhouse gases. Scientific studies have shown that the percentage of carbon dioxide in the earth's atmosphere has been steadily rising. Carbon dioxide is one of several gases that tend to absorb reflected solar radiation, trapping the sun's heat within the atmosphere. This process may cause the average temperature of the planet to rise, causing uncertain, but potentially drastic, changes in global climate.

All fossil fuels emit carbon dioxide when burned. However, coal emits nearly twice as much carbon dioxide per unit of energy consumed as natural gas, and 20 percent more carbon dioxide than fuel oil. Hence, coal-fired power stations are prime candidates for controls on carbon dioxide emissions.

The United States is coming under increasing international pressure to commit itself to limiting the growth of global carbon emissions. Given the high costs of limiting carbon emissions, the scientific uncertainty about the magnitude and timing of the consequences of carbon dioxide build-up, and the slow pace of U.S. and international environmental decision-making, no actions affecting the coal industry may be expected for some years to come. However, limitations on carbon dioxide emissions may tend to reduce the market share of coal in power generation in the late 1990s.

This chapter was prepared by the Energy Information Administration, the independent statistical and analytical agency within the Department of Energy. The information contained herein should not be construed as advocating or necessarily reflecting any policy position of the Department of Energy or any other organization.—Arthur Rypinski, Energy Information Administration, (202) 586-8425, September 1990.

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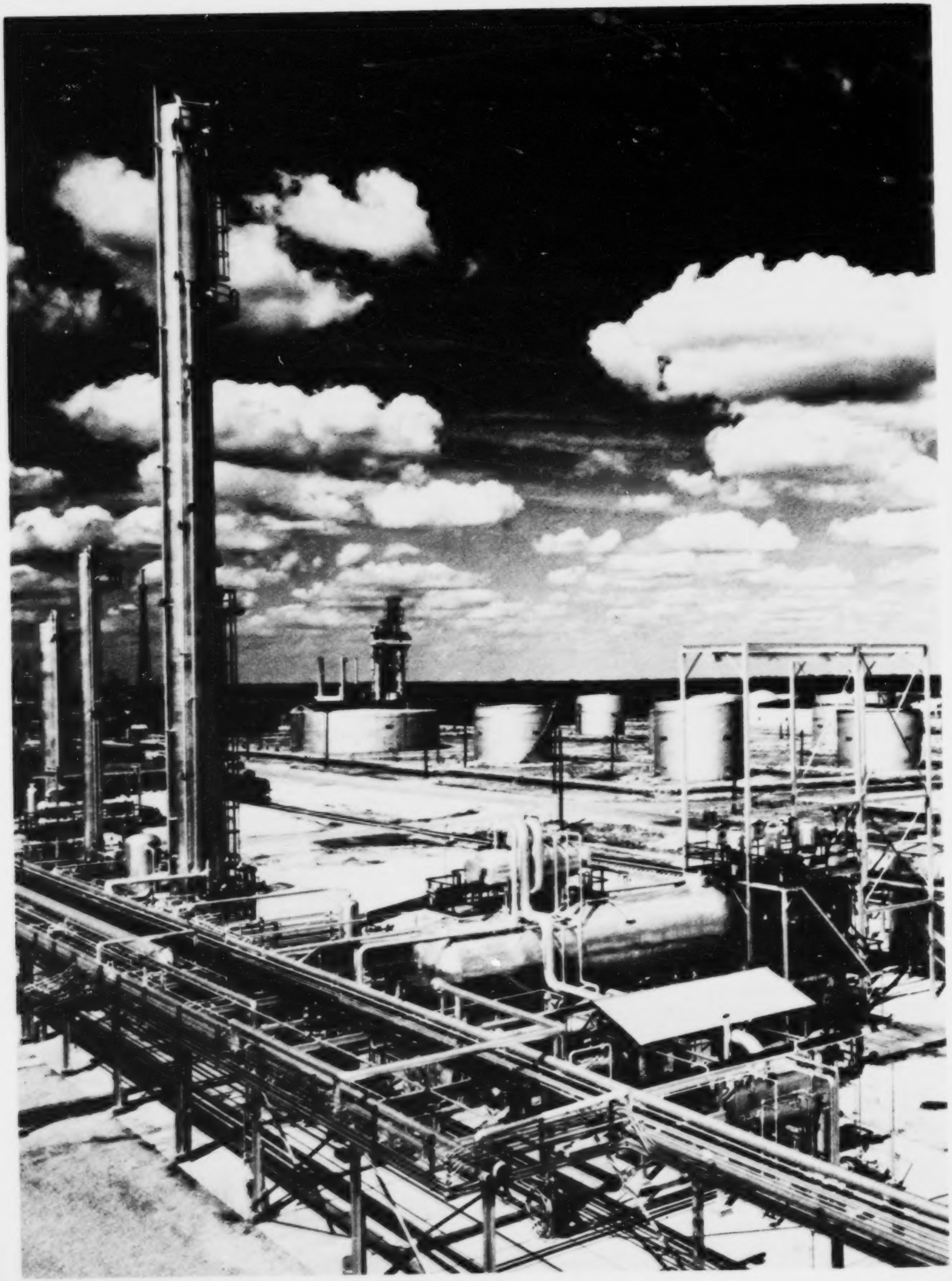

3

Crude Petroleum and Natural Gas

In view of the unknown duration and scope of the Middle East crisis, the outlook for the crude petroleum and natural gas industry is conjectural at best. The price and availability of Middle East oil, environmental concerns, alternative sources of supply, and economic growth rates will shape both the short- and long-term outlook for the industry.

The crude petroleum and natural gas industry (SIC 1311) is made up of establishments engaged in operating oil and gas field properties. Such activities include exploration for crude petroleum and natural gas; drilling, completing and equipping wells; operation of separators, emulsion breakers, desilting equipment; and all other activities incident to making oil and gas marketable up to the point of shipment from the producing property. This industry also includes production of oil through the mining and extraction of oil from oil shale and oil sands, and the production of gas and hydrocarbon liquids through gasification, liquefaction, and pyrolysis of coal at the mine site. Coal mining and petroleum refining are covered separately in chapters 2 and 4, respectively.

Three factors will largely shape the U.S. crude petroleum and natural gas industry in the mid-1990s: the price and availability of oil from the Middle East, changes in environmental policies, and the continued decline in U.S. production of crude oil. The likely result will be increased U.S. and world dependence on oil from members of the Organization of Petroleum Exporting Countries (OPEC), higher energy prices, and a higher growth rate for natural gas production than for other fuels. All three factors, which will likely be reinforced by a decrease in Soviet oil exports and offset to some extent by improvements in drilling, make for a highly uncertain future for the industry.

The uncertainty was intensified by Iraq's invasion of Kuwait at the beginning of August 1990, which lead to an increase in the spot price of West Texas Intermediate crude oil to more than $30 a barrel. The United Nations trade embargo that was imposed immediately after the invasion reduced petroleum supplies from Iraq and Kuwait by 4 million to 5 million barrels a day, the equivalent of about 9 percent of world production. Before the invasion, U.S. imports from the two countries were about 700,000 barrels a day, or about 9 percent of its net petroleum imports and 4 percent of net consumption. The loss of crude oil from Iraq and Kuwait was roughly equal to the excess production capacity in the rest of the world, most of it in OPEC countries, (particularly Saudi Arabia). A substantial portion of the excess is being brought into production. This together with a drawdown in world commercial stocks (which were the highest in nine years at the time of the invasion), lower demand due to higher petroleum prices, and slower economic growth rates around the globe could compensate for a substantial portion of lost petroleum exports from Iraq and Kuwait.

Iraq's invasion was apparently motivated in part by Kuwait's decision to exceed its assigned production quotas, which tended to depress oil prices and contributed to the high level of world inventories. Earlier in 1990, OPEC had adopted new crude oil agreements intended to reverse falling oil prices. The agreement set the production ceiling for the second half of 1990 at 22.5 million barrels a day (excluding natural gas liquids), or nearly 1 million barrels a day below what was being produced. The agreement also provided for an increase in the minimum reference (or target) price from $18 to $21 a barrel. A month after the invasion, OPEC, in effect, suspended the agreement to allow members to use any excess capacity and thus

Trends and Forecasts: Crude Petroleum and Natural Gas (SIC 1311)

(in millions of dollars except as noted)

Item	1987	1988	1989	1990[1]	1991[2]	Percent Change 1987–88	Percent Change 1988–89	Percent Change 1989–90	Percent Change 1990–91
Industry Data									
Value of shipments[3]	76,288	67,908	75,128	—	—	−11.0	10.6	—	—
Value of shipments (1987$)	76,288	75,985	73,158	—	—	−0.4	−3.7	—	—
Total employment (000)	204	—	—	—	—	—	—	—	—
Production workers (000)	69.4	—	—	—	—	—	—	—	—
Average hourly earnings ($)	15.15	—	—	—	—	—	—	—	—
Product Data									
Value of shipments[4]	76,272	67,893	75,111	—	—	−11.0	10.6	—	—
Value of shipments (1987$)	76,272	75,969	73,141	—	—	−0.4	−3.7	—	—

[1] Estimate.

[2] Forecast.

[3] Value of all products and services sold by establishments in the crude petroleum and natural gas industry.

[4] Value of products classified in the crude petroleum and natural gas industry produced by all industries.

SOURCE: U.S. Department of Commerce: Bureau of the Census, International Trade Administration; U.S. Department of Energy, and Energy Information Administration (EIA).

U.S. Exports and Imports
Crude Petroleum and Natural Gas

(in millions of dollars except as noted)

SIC	Industry	1989	1990[1]	1991[2]	Percent Change 1989-90	Percent Change 1990-91
1311	Crude petroleum and natural gas					
	Value of exports	289	—	—	—	—
	Value of imports	36,815	—	—	—	—

[1] Estimate.

[2] Forecast.

SOURCE: U.S. Department of Commerce: Bureau of the Census, International Trade Administration (ITA).

offset as much of the shortfall from Iraq and Kuwait as possible.

Environmental concerns also will shape the future of the crude petroleum and natural gas industry. In 1990, lease sales in certain environmentally sensitive areas off the California and Florida coasts and off the coasts of certain other states were postponed. A wide range of proposed revisions of the Clean Air Act could lead electric utilites to use more natural gas, which has the lowest sulfur content among the fossil fuels.

Several developments will add to future energy supplies and may help constrain price increases. One is the increased use of horizontal drilling. Another is the extraction of methane gas from coal seams.

Horizontal drilling has increased rapidly in recent years, particularly in the United States. The technique facilitates recovery of reserves from shallow deposits, and is particularly suitable for fields containing many small deposits at similar depths that otherwise might be uneconomic to drill. Suitable for onshore and offshore operations, horizontal drilling also has applications for natural gas production.

The number of horizontal wells drilled in the United States grew from about 250 in 1989 to more than 750 in 1990. However, the number is still small compared with the total number of wells drilled (Table 1). In many instances, horizontal drilling has increased production substantially, transforming marginal operations into profitable ones and making relatively inaccessible reserves easily accessible.

U.S. Trade Patterns in 1989
Crude Petroleum and Natural Gas
SIC 1311

(in millions of dollars, percent)

Exports	Value	Share	Imports	Value	Share
Canada & Mexico	116	40.0	Canada & Mexico	8,827	24.0
South America	0.1	0.0	South America	4,483	12.2
European Community	0.1	0.0	European Community	1,209	3.3
East Asia NICs	12.7	4.4	East Asia NICs	1,447	3.9
Japan	158	54.5	Japan	0.0	0.0
Other	3.0	1.0	Other	20,848	56.6
World Total	289	100.0	World Total	36,815	100.0

Top Five Countries

Exports	Value	Share	Imports	Value	Share
Japan	158	54.5	Saudi Arabia	6,392	17.4
Canada	59.8	20.7	Nigeria	5,057	13.7
Mexico	55.7	19.3	Canada	4,828	13.1
Taiwan	11.5	4.0	Mexico	3,999	10.9
Trinidad and Tobago	1.7	0.6	Venezuela	2,979	8.1

See "How to Get the Most Out of This Book" for definitions of the Country Groupings.

SOURCE: U.S. Department of Commerce: Bureau of the Census, International Trade Administration (ITA).

Crude petroleum is not the only hydrocarbon to benefit from new production developments. Additional supplies of natural gas are emerging from a relatively new industry: the production of methane gas from coal seams. More than 2,000 wells were producing methane gas from coal seams during 1990. The recent rapid development of this method was spurred largely by a tax credit that was scheduled to expire at the end of 1990. Coal seam wells started by then are eligible for the credit for the next 10 years. In mid-1990 the credit was equal to a large percentage of the natural gas wellhead price.

Table 1: Exploration and Development Indicators for U.S. Liquid and Gaseous Hydrocarbons, 1987–89

Year	Total Wells Completed (thousands)	Rotary Rigs[1] (weekly average)	Seismic Crews[2] (monthly average)
1987	35.41	936	176
1988	31.85	936	182
1989	28.34	869	132

[1] Average number in use.

[2] Average number.

SOURCE: U.S Department of Energy, Energy Information Administration; Hughes Tool Company; American Petroleum Institute; Society of Exploration Geophysicists.

Outlook for 1991

Given the uncertainty of the Middle East situation in late 1990, any forecast of U.S. crude oil consumption, imports, and prices would be conjectural. However, the effects of the crisis on a wide range of crude oil prices can be estimated. These scenarios are presented separately in the September 1990 Special Issue of the *Short-Term Energy Outlook* cited under the additional references at the end of this chapter.

U.S. crude oil production has been declining rapidly during recent years (Table 2). Production had been expected to continue to decline in 1991, but stepped up Alaskan production in response to the Middle East crisis could, if sustained, temporarily arrest the decline.

U.S. consumption of natural gas, which is less susceptible to Middle East developments than oil, has increased during the past few years (Table 3). Nevertheless, production, consumption, and prices of natural gas will be affected by the rate of economic growth. In 1991, more normal weather patterns after the exceptionally mild weather of a year earlier would help the U.S. industry. But given existing plant and equipment, any switching to natural gas for electricity generation or in the industrial sector is not likely to grow much beyond what has already occurred.

Production of methane from coal seams, which was practically nonexistent before the late 1980s, is expected to contribute significantly to U.S. natural gas supplies. Production could exceed 2 percent of total natural gas produced in 1991. But unless natural gas prices increase substantially in the early 1990s, the end of the tax credit could hinder further growth in coal seam gas production (Tables 4 and 5). Indeed, the possibility of extending the tax credit is already being discussed. Elimination of Federal wellhead price controls on additional volumes of natural gas in 1991 will have little effect on prices because the bulk of domestically produced natural gas is already free of such controls.

Table 2: U.S. Production of Energy by Source, 1987–89

Year	Crude Oil[1] (million bbls per day)	Natural Gas[2] (trillion cu. ft.)	Natural Gas Plant liquids (million bbls per day)	Coal (million short tons)	Hydroelectric Power (billion kWh)	Nuclear Electric Power (billion kWh)	Other (billion kWh)	Total Energy[1] (quadrillion Btu)
1987	8.349	16.54	1.595	918.8	249.7	455.3	12.3	64.82
1988	8.140	16.99	1.625	950.3	222.9	327.0	12.0	65.97
1989	7.613	17.12	1.546	979.6	265.1	529.4	11.3	65.87

[1] Includes lease condensate.

[2] Dry natural gas.

[3] Total production is based on a narrow definition of renewable energy, which exludes wood, waste, geothermal, wind, photovoltaic, and solar thermal energy except for small amounts used by electric utilities to generate electricity for distribution.

SOURCE: U.S. Department of Energy, Energy Information Administration.

Table 3: U.S. Consumption of Energy by Selected Sources, 1987–89

Year	Petroleum Products (million bbls per day)	Natural Gas (trillion cu. ft.)	Coal (million short tons)	Nuclear Power (quadrillion Btu)
1987	16.67	17.21	836.9	4.906
1988	17.28	18.03	883.7	5.661
1989	17.33	18.81	889.5	5.687

SOURCE: U.S. Department of Energy, Energy Information Administration.

Regardless of the outcome of the Middle East crisis, imports of natural gas could continue to increase in 1991. That would tend to dampen price increases that would otherwise occur (Table 6).

Long-Term Prospects

In light of the Middle East crisis, the outlook for the U.S. crude petroleum and natural gas industry to 1995 is highly uncertain. However, cumulative U.S. production of both primary forms of energy is likely to be greater than if the Iraqi invasion had not occurred. Long-run prospects will also be affected by the world economic growth rate; OPEC production capacity; increased emphasis on alternatives to oil; environmental policies; and increases in energy efficiency. All of these factors are highly interdependent and uncertain.

A substantial portion of excess OPEC capacity is likely to be brought on line if the Middle East crisis is prolonged. Even without the crisis, however, continued world economic growth would have made inroads into the excess and contributed to substantially higher prices. The course of crude oil prices in the 1990s will depend, in large part, on the capacity to produce that oil. Generally, only OPEC has the potential to greatly increase capacity and production. Non-OPEC oil production should increase slowly over the next few years. However, it is unlikely that the non-OPEC increase will be sufficient to offset the increased demand on OPEC oil, and real crude oil prices will likely be substantially higher in 1995 than they were before the crisis. How much higher depends largely on the rate at which OPEC expands its capacity, the ability and willingness of OPEC members to agree on production levels, and Middle East events.

Table 4: U.S. Wellhead Prices of Domestically Produced Crude Oil and Natural Gas, 1987–89

Year	Crude Oil ($/per barrel)	Natural Gas* ($/Thousand cubic feet)
1987	15.40	1.67
1988	12.58	1.69
1989	15.85	1.71

*Wet natural gas prior to extraction of natural gas plant liquids.

SOURCE: U.S. Department of Energy, Energy Information Administration.

Table 5: U.S. Wellhead Prices of Domestically Produced Crude Oil and Natural Gas in 1982 Dollars, 1987–89

(in cents per million Btu)

Year	Crude Oil[1]	Natural Gas[2]
1987	226.1	127.9
1988	178.8	125.6
1989	216.4	122.1

[1] Includes lease condensate.

[2] Wet natural gas prior to extraction of natural gas plant liquids.

SOURCE: U.S. Department of Energy, Energy Information Administration.

Table 6: U.S. Gross Imports of Energy by Source, 1987–89

Year	Crude Oil (million bbls per day)	Petroleum Products (million bbls per day)	Natural Gas (trillion cu. ft.)	Total Energy* (quadrillion Btu)
1987	4.67	2.00	0.99	15.76
1988	5.11	2.30	1.29	17.56
1989	5.84	2.22	1.38	18.95

*Includes all forms of energy.

SOURCE: U.S. Department of Energy, Energy Information Administration.

The need to expand capacity is likely to lead U.S. companies to shift more funds from domestic petroleum development to development abroad. In recent years there has already been a significant shift because of lower developmental costs abroad and a dwindling potential for discovering substantial new domestic fields. A ban on drilling in prospective offshore and Alaskan areas has further constrained domestic development. The shift to overseas drilling could accelerate in future years and help sustain non-OPEC production. Increased foreign investment is being encouraged by countries that previously closed their doors to United States and other foreign developers. These countries, which include Mexico, the Soviet Union, and China, account for a large percentage of world reserves and production. Despite the increasing number of non-OPEC countries that are encouraging development by foreign companies, non-OPEC production capacity is unlikely to increase noticeably by 1995 because production capacity in some non-OPEC areas, notably the United States, is expected to decline rapidly.

Reserves of natural gas are large (Table 7), and gas is projected to be the fastest growing source of energy during the next decade. The higher price of oil is one reason. But gas also contains less carbon and sulfur, which makes it a cleaner-burning fuel. In addition, controlling environmental hazards during production is less costly for gas than for oil. Eventually, the transportation sector may be using natural gas and other fuels to meet more stringent mileage requirements and emission restraints. And electric utilities will contribute substantially to the projected increase in demand for gas. Part of

Table 7: U.S. Proved Reserves of Crude Oil, Natural Gas, and Natural Gas Liquids at End of Year, 1987–89

Year	Crude Oil (billion bbls)	Natural Gas (trillion cu.ft.)	Natural Gas Liquids (billion bbls)	Total (billion bbls COE)
1987	27.3	187.2	8.1	66.3
1988	26.8	168.0[1]	8.2	62.5
1989[2]	26.5	167.1	7.7	NA

[1] Alaska North Slope reserves were revised downward by 24.6 trillion cubic feet in 1988.

[2] Preliminary.

NA = Not available.

COE = Crude oil equivalent

SOURCE: U.S. Department of Energy, Energy Information Administration.

this gas will come from foreign supplies, and a much smaller volume will come from imported liquefied natural gas (LNG).

U.S. imports of Canadian natural gas are expected to continue to increase as new pipelines are built and old lines expanded. Canadian gas drilling is becoming more important relative to oil drilling, an indication that Canadian producers anticipate expanding markets.

Table 8: U.S. Refiner Acquisition Cost of Imported and Domestically Produced Crude Oil, 1987–89

Year	Imported Crude		U.S. Produced Crude	
	Price ($/bbl)	Index (1987=100)	Price ($/bbl)	Index (1987=100)
1987	18.13	100.0	17.76	100.0
1988	14.56	80.3	14.74	83.0
1989	18.08	99.7	17.88	100.7

SOURCE: U.S. Department of Energy, Energy Information Administration.

The projected 1995 weighted average price for all U.S. primary energy sources will probably be substantially higher, after adjusting for inflation, than before the Iraqi invasion. Already before the crisis, demand pressures and capacity constraints indicated that the real price of crude oil would rise (Tables 4, 5, and 8). The wellhead price of natural gas is expected to increase rapidly between 1990 and 1995 as excess gas capacity is absorbed. However, the expected increase in the weighted average price of U.S. primary sources of energy, particularly the increases in the crude oil and natural gas components, could be largely offset by lower economic growth and increased conservation and energy efficiency (Table 9).

U.S. consumption of energy has grown substantially during recent years (Table 10). By 1995, the economy is projected to be more coal and natural gas intensive and less petroleum intensive than during the first-half of 1990. Pending amendments to the Clean Air Act would increase demand for natural gas. However, there are constraints on any increased use of natural gas, including the need for additional pipelines.

Table 9: U.S. Energy Consumption per Real GNP Dollar, 1987–89

(in thousand Btu per 1982 dollar GNP)

Year	All Energy*	Petroleum and Natural Gas
1987	20.0	13.2
1988	20.0	13.1
1989	19.7	13.0

*Based on a narrow definition of renewable energy, which excludes wood, waste, geothermal, wind, photovoltaic, and solar thermal energy except for small amounts used by electric utilities to generate electricity for distribution.

SOURCE: U.S. Department of Energy, Energy Information Administration.

Total U.S. energy production is expected to be somewhat greater in 1995 than in 1990, despite a substantial decrease in U.S. crude oil production. Crude oil production will be lower in part because depletion of proven reserves is not being offset by new discoveries, and partly because of constraints on offshore drilling. However, large increases in natural gas and coal production, as well as some increases in renewable energy, will more than offset lower crude oil production. A large market for incremental natural gas production will be electric utilities, as major efforts are made to reduce sulfur dioxide emissions. Nuclear power generation is expected to be approximately the same in 1995 as in 1990.

Table 10: U.S. Energy Production, Consumption, Imports, and Exports, 1987–89

(in quadrillion Btu)

Year	Production*	Consumption*	Gross Imports	Gross Exports	Net Imports
1987	64.82	76.85	15.76	3.85	11.90
1988	65.97	80.20	17.56	4.42	13.15
1989	65.87	81.28	18.95	4.78	14.17

*Total production and total consumption are based on a narrow definition of renewable energy, which excludes wood, waste, geothermal, wind, photovoltaic, and solar thermal energy except for small amounts used by electric utilities to generate electricity for distribution.

SOURCE: U.S. Department of Energy, Energy Information Administration.

Imports of crude petroleum will comprise a major part of the domestic petroleum supply in 1995. Natural gas imports are expected to increase even further and could be as much as 50 percent greater in 1995 (Table 6).

This chapter was prepared by the Energy Information Administration (EIA), the independent statistical and analytical agency within the Department of Energy. The information contained herein should not be construed as advocating or necessarily reflecting any policy position of the Department of Energy or any other organization.—Gerard L. Lagace, Energy Information Administration, (202) 586-1452, September 1990.

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4

Petroleum Refining

Crude oil distillation capacity and downstream charge capacity of the U.S. petroleum refining industry (SIC 2911) are expected to increase only slightly in the near future. In 1990 the average utilization rate was about 92 percent. Any change in demand for refined petroleum products in the near future is highly uncertain because of unstable crude oil prices and the probable effects of new environmental regulations.

This industry is made up of establishments primarily engaged in producing gasoline, kerosene, distillate fuel oils, residual fuel oils, and lubricants, through fractionation or straight distillation of crude oil, redistillation of unfinished petroleum derivatives, cracking, or other processes. Establishments of this industry also produce aliphatic and aromatic chemicals as byproducts.

The U.S. petroleum refining industry is in a healthy but tenuous condition. Just prior to the Iraqi invasion of Kuwait, worldwide crude oil supplies were in excess, refiner acquisition costs of crude oil were low, and profit margins were up. The Middle East flareup altered the state of the industry. Even beyond that, however, declining U.S. crude oil production, high utilization rates, and increasing environmental constraints pose a series of challenges for the industry for at least the next five years. If the conflict in the Middle East persists long enough, the industry's continued economic recovery will become less certain. This is especially so in light of the intense capital investment and major production adjustments refiners will have to make in response to pending environmental legislation.

The Middle East is regaining its dominant position in the world crude oil market as U.S. oil production declines. In the process, U.S. refiners will become more dependent on crude supplies from the Middle East during the forecast period and will be forced to develop various strategies to cope with current and potential future supply disruptions. In the near term, refiners could become less dependent on the Middle East if part of the shortfall is made up by increased production from other producing areas, such as Venezuela and Mexico.

Strengthened relationships with foreign producers are likely as refiners struggle to stabilize the flow of crude oil in an increasingly unstable market. These may be in the form

U.S. Trade Patterns in 1989
Petroleum Refining
SIC 2911
(in millions of dollars, percent)

Exports	Value	Share	Imports	Value	Share
Canada & Mexico	1,145	25.7	Canada & Mexico	1,802	15.2
South America	322	7.2	South America	3,951	33.4
European Community	514	11.5	European Community	1,914	16.2
East Asia NICs	768	17.2	East Asia NICs	371	3.1
Japan	704	15.8	Japan	47.0	0.4
Other	1,012	22.7	Other	3,750	31.7
World Total	4,464	100.0	World Total	11,835	100.0
Top Five Countries					
	Value	Share		Value	Share
Japan	704	15.8	Venezuela	2,626	22.2
Canada	596	13.4	Canada	1,680	14.2
Mexico	549	12.3	Algeria	710	6.0
Taiwan	427	9.6	Brazil	695	5.9
Netherlands	200	4.5	Saudi Arabia	525	4.4

See "How to Get the Most Out of This Book" for definitions of the Country Groupings.
SOURCE: U.S. Department of Commerce: Bureau of the Census, International Trade Administration (ITA).

Trends and Forecasts: Petroleum Refining (SIC 2911)
(in millions of dollars except as noted)

						Percent Change			
Item	1987	1988[1]	1989[2]	1990[2]	1991[3]	1987–88	1988–89	1989–90	1990–91
Industry Data									
Value of shipments[4]	118,216	117,943	135,382	–	–	–0.2	14.8	–	–
Value of shipments (1987$)	118,216	123,714	125,354	–	–	4.7	1.3	–	–
Total employment (000)	74.6	73.3	–	–	–	–1.7	–	–	–
Production workers (000)	50.0	49.5	–	–	–	–1.0	–	–	–
Average hourly earnings ($)	17.40	17.75	–	–	–	2.0	–	–	–
Capital expenditures	2,035	2,264	–	–	–	11.3	–	–	–
Product Data									
Value of shipments[5]	114,307	114,057	131,093	–	–	–0.2	14.9	–	–
Value of shipments (1987$)	114,307	119,794	121,382	–	–	4.8	1.3	–	–

[1] Advance data from the 1988 Annual Survey of Manufactures.
[2] Estimate.
[3] Forecast.
[4] Value of all products and services sold by establishments in the petroleum refining industry.
[5] Value of products classified in the petroleum refining industry produced by all industries.

SOURCE: U.S. Department of Commerce: Bureau of the Census, International Trade Administration. Estimates and forecasts by Energy Information Administration.

of long-term contracts in which prices are tied to the developments in the markets for refined products and crude oil; or they may be in the form of joint ventures between refiners and foreign producers. What starts out as a joint venture, though, may end up as an outright purchase, as occurred when Petroleos de Venezuela (PDVSA) bought out the remaining 50-percent interest in CITGO Petroleum's 320,000-barrel-per-day refinery at Lake Charles, Louisiana. In November 1989 PDVSA also purchased a 50-percent interest in UNOCAL's 147,000-barrel-per-day Illinois refinery and its associated marketing outlets.

U.S. Exports and Imports
Petroleum Refining

(in millions of dollars except as noted)

SIC	Industry	1989	1990[1]	1991[2]	Percent Change 1989-90	Percent Change 1990-91
2911	Petroleum refining					
	Value of exports	4,464	—	—	—	—
	Value of imports	11,835	—	—	—	—

[1] Estimate.

[2] Forecast.

SOURCE: U.S. Department of Commerce: Bureau of the Census, International Trade Administration (ITA). Estimates and forecasts by ITA.

The U.S. refining industry is currently operating near maximum capacity, with an average annual utilization rate of approximately 92 percent. Seasonal peak demand can temporarily raise utilization to 100 percent. Demand for petroleum products is likely to increase during the next five years, and plans are afoot to add 272,000 barrels per calendar day of crude oil distillation capacity, of which 120,000 is new. The remainder is made of reactivations and expansions. These additions will take place over the next five years and represent less than 2 percent of operating capacity as of January 1, 1990.

With the industry operating near maximum capacity, refinery downtime takes on added importance. Scheduling downtime for routine maintenance has become a critical operation. Unexpected shutdowns are having a greater impact on supplies of petroleum products in some localities.

Beyond its immediate problems, the industry will have to make major capital investments over the next five years to meet new Clean Air Act requirements.

Outlook for 1991

The petroleum refining industry is projected to begin 1991 with crude oil distillation capacity of 15.5 million barrels per day, a slight decline from 1990 (Table 1). Total downstream charge capacity is projected to be 29.8 million barrels per stream day, unchanged from 1990. Utilization rates were at high operating levels before the Middle East crisis erupted, and demand for petroleum products was increasing (Tables 2 and 3). Little growth in demand for petroleum products beyond pre-crisis levels is projected for the immediate future.

Table 2: Petroleum Products Supplied to U.S. End-Use Sectors, 1987–89

(in millions of barrels per day)

Year	Residential and Commercial	Industrial	Transportation	Electric Utilities	Total[1]
1987	1.37	4.26	10.49	0.55	16.67
1988	1.41	4.37	10.82	0.68	17.28
1989[2]	1.40	4.32	10.87	0.74	17.33

[1] Total may not equal the sum of components due to independent rounding.

[2] Estimate.

SOURCE: U.S. Department of Energy, Energy Information Administration.

Specific numerical forecasts of developments in the petroleum refining industry would be conjectural in view of the Middle East crisis. However, the effects of a wide range of alternative crude oil prices can be roughly approximated. These scenarios are presented separately in the September 1990 Special Issue of the *Short-Term Energy Outlook* cited in the "Additional References" at the of this chapter.

Long-Term Prospects

Environmental constraints pose the most serious challenge to the economic viability of the U.S. refining industry. Transportation fuels are a major focus of pending clean air regulations because they are a major source of air pollution in crowded, urban areas. At a minimum, motor gasoline formulas will undergo considerable change. Alternative clean fuels may also be mandated for specific problem areas. Gasoline will have to be reformulated with increased oxygen content, lower aromatics, and lower vapor pressure. The levels of sulfur and aromatics in diesel fuel also will have to be lowered.

Gasoline reformulation will likely necessitate major changes in refinery processing and will require a capital investment ranging from $10 billion to $30 billion during the next decade. This would add 5 cents to 10 cents to the price of a gallon of gasoline. If the cost of these changes are severe enough to cut profits deeply, the industry may become more concentrated, with small, independent refiners closing or absorbed by major integrated companies.

Table 1: U.S. Refineries and Refining Capacities, 1987–91

(as of January 1)

Year	Operable Refineries		Crude Distillation Capacity (in thousand bbls per calendar day)		Downstream Charge Capacity (in thousand bbls per stream day)						
	Total	Operating	Total	Operating	Total	Vacuum Distillation	Thermal Cracking	Catalytic Cracking (Fresh & Recycled)	Catalytic Reforming	Catalytic Hydro-cracking	Catalytic Hydro-treating
1987	219	195	15,565	14,940	28,656	6,935	1,928	5,716	3,805	1,189	9,063
1988	213	195	15,915	15,018	29,347	7,198	2,080	5,806	3,891	1,202	9,170
1989	204	193	15,655	15,012	29,537	7,225	2,073	5,650	3,911	1,238	9,440
1990	205	194	15,571	15,063	29,823	7,245	2,108	5,755	3,896	1,282	9,537
1991[1]	NA	NA	15,542	NA	29,824	7,239	2,110	5,726	3,910	1,292	9,547

NA = Not available.

[1] Forecast.

SOURCE: U.S. Department of Energy, Energy Information Administration.

Table 3: Petroleum Products Supplied to the U. S. Market by Type, 1987–89[1]

(in millions of barrels per day)

Year	Motor Gasoline	Distillate Fuel Oil	Residual Fuel Oil	Other Products	Total Products[2]
1987	7.21	2.98	1.26	5.22	16.67
1988	7.34	3.12	1.38	5.44	17.28
1989	7.33	3.16	1.37	5.47	17.33

[1] Products supplied to the U.S. market from U.S. production and imports.

[2] Total may not equal the sum of components due to independent rounding.

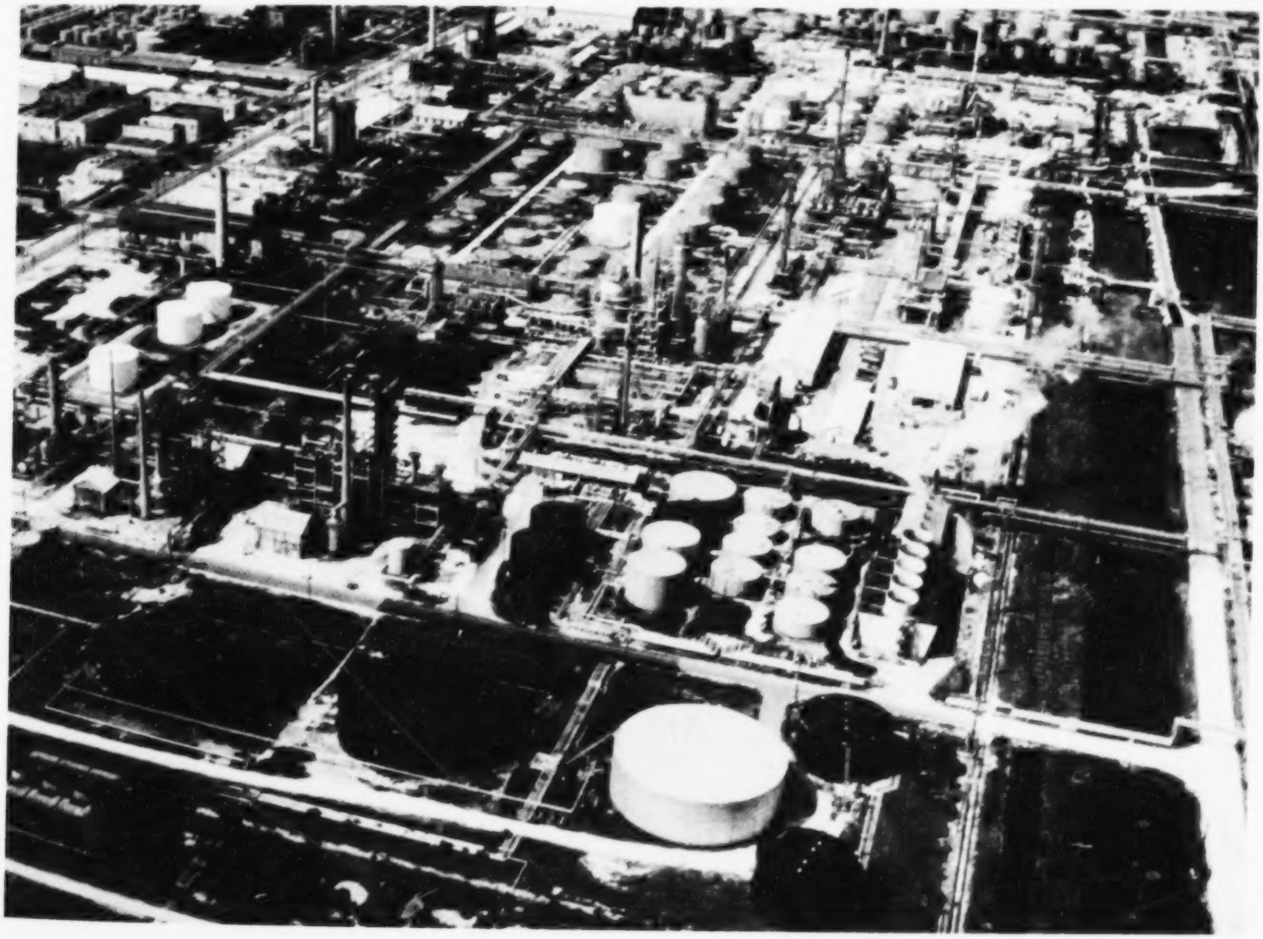
SOURCE: U.S. Department of Energy, Energy Information Administration.

Growing demand for a lighter mix of environmentally suitable refined products, especially unleaded gasoline, requires more processing, thereby further straining an already tight downstream capacity. At the same time, gasoline reformulation may require less crude oil, depending on the types of additives used. This poses refinery configuration problems. For example, if less crude oil is used in the production of gasoline, there will be less output of other products such as jet fuel and distillate fuel oils. New clean air requirements will also lead to surplus quantities of unwanted components, such as aromatics and benzene, and greater reliance on a shrinking pool of imported gasoline. There will also be limits on the octane rating of premium gasoline.

U.S. refinery output is not likely to increase significantly beyond the 1989 level, given present and planned capacity (Table 4). Motor gasoline production capacity in the U.S. is nearly fully utilized. Refiners that plan to meet marginal increases in demand for motor gasoline by importing more will face increased competition for supply as the trend toward more environmentally suitable products spreads worldwide. Competition in the world market for exportable light products is beginning to escalate, with European demand on the rise, particularly for unleaded gasoline. East Coast refiners, which account for more than 90 percent of total U.S. unleaded gasoline imports, will be affected most by this increased competition.

If Congress mandates development of alternative fuels for selected parts of the country, refiners will also face various new developmental, logistical, and integration costs. In addition, marketing factors, logistics, and state law could force refiners to make the new fuels available in other parts of the country as well.

The refining industry has been in a state of flux since the mid-1970s. Crude distillation capacity is currently adequate, and refiners are likely to hesitate to add significantly to capacity. Prospects for increased demand beyond the 1989 level are soft, at best (Table 5). The recent instability



Demand for petroleum products is likely to increase during the next five years.

Texaco

Table 4: U. S. Refinery Output, Net Imports, and Products Supplied, 1987–89

(in millions of barrels per day)

Year	Refinery Output	Net Imports[1]	Products Supplied[2]
1987	14.63	1.39	16.67
1988	15.02	1.63	17.28
1989	15.18	1.50	17.33

[1] Net imports equals gross imports minus gross exports.

[2] Includes output from natural gas processing plants, refinery gains, crude oil burned directly, and inventory changes.

SOURCE: U.S. Department of Energy, Energy Information Administration.

in crude oil and product prices (Table 6 and Chapter 3, Table 4), the prospects for further instability, and expectations for higher product prices are liable to dampen demand for petroleum products. Given the current equilibrium between demand for petroleum products and refinery capacity, any significant increases in demand beyond minor adjustments are likely to push up product prices.

Over the past 10 years, refiners have been adding downstream capacity such as catalytic cracking, catalytic reforming, catalytic hydrotreating, and vacuum distillation. Between 1981 and 1989, the major integrated oil companies, which accounted for 65 to 75 percent of total U.S. refining capacity, spent nearly $18 billion on refining operations. This downstream processing capability was added in response to increased demand for lighter products to meet environmental requirements, and to achieve greater flexibility in processing a wider range of crude oil inputs. If there were no significant changes on the horizon, the industry would be well positioned relative to worldwide crude oil availability. However, pending environmental legislation is likely to be as severe as the last round. Refiners may have to make major adjustments in a short time to meet current levels of demand with products that satisfy as yet undefined legislative criteria.

Table 5: U. S. Consumption of Petroleum Products and Total Energy, 1987–89

(in quadrillions of Btu)

Year	Petroleum Products[1]	Total Energy[2]	Petroleum Products as a Percentage of all energy
1987	32.87	76.85	42.8
1988	34.23	80.20	42.7
1989	34.21	81.28	42.1

[1] Petroleum products include natural gas plant liquids and crude oil burned as fuel.

[2] Total energy is based on a narrow definition of renewable energy, which excludes wood, waste, geothermal, wind, photovoltaic, and solar thermal energy except for small amounts used by electric utilities to generate electricity for distribution.

SOURCE: U.S. Department of Energy, Energy Information Administration.

Table 6: U.S. Refiner Sales Prices of Petroleum Products, 1987–89

(in cents per gallon, excluding taxes)

Year	For Resale*			To End-Users*		
	Finished Motor Gasoline	No. 2 Fuel Oil	No. 2 Diesel Fuel	Finished Motor Gasoline	No. 2 Fuel Oil	No. 2 Diesel Fuel
1987	56.9	52.7	53.4	66.9	58.1	55.1
1988	57.7	47.3	47.3	67.3	54.4	50.0
1989	65.5	56.5	56.8	75.8	59.1	58.4

*Sales for resale, that is wholesale sales, are those made to purchasers who are other than ultimate consumers. Sales to end-users are those made directly to the ultimate consumer, including bulk customers such as agriculture, industry, and utilities, as well as residential and commercial customers.

SOURCE: U.S. Department of Energy, Energy Information Administration.

This chapter was prepared by the Energy Information Administration, the independent statistical and analytical agency within the Department of Energy. The information contained herein should not be construed as advocating or necessarily reflecting any policy position of the Department of Energy or any other organization.—Gregory P. Filas, Energy Information Administration, (202) 586-1347, September 1990.

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5

Construction

In 1991 the constant-dollar value of new construction put in place will decline slightly from its 1990 level, while repair and remodeling work will increase. The number of housing starts, especially single-family homes, is expected to decrease. Commercial construction will continue to decline, because business investment will be weighted toward new equipment rather than structures. Public works construction will be slightly higher. U.S. contractors are expected to win a large share of the international construction contracts, although prospects in the important Middle Eastern market are uncertain.

The inflation-adjusted value of new construction put in place declined slightly in 1990, and was about 4 percent lower than the all-time record level of 1986 (see Table 1). The 1990 current-dollar value of about $445 billion was an all-time record. Small increases in public works construction were more than offset by declines in private construction. While the number of housing starts declined by 11 percent to 1.2 million units, the value of residential construction only decreased by 5 percent because of a small gain in average house size and an increase in home improvement spending. Public works construction increased slightly, led by strong spending for schools and waterworks. The decline in private nonresidential construction was largely attributable to high vacancy rates for commercial buildings in most cities, as well as tighter lending standards for real estate development.

Before reading this chapter, please see "How to Get the Most Out of This Book" on page one. It will clarify questions you may have concerning data collection procedure, factors affecting trade data, forecasting methodology, the use of constant dollars, the difference between industry and product data, sources and references, and the Standard Industrial

Table 1: Value of New Construction Put in Place, 1986–95

(in billions of 1987 dollars except as noted)

Type of Construction	1986	1987	1988	1989	1990[1]	1991[2]	Percent Change 1989-90	Percent Change 1990-91	Percent Change 1990-95[3]
Total New Construction	411.6	410.2	405.2	399.9	394.6	383.3	−1	−3	1
Residential	195.4	194.6	190.3	182.0	172.9	167.7	−5	−3	1
Single-family	106.6	114.4	112.0	108.3	99.6	94.7	−8	−5	1
Multifamily	32.4	25.5	21.4	20.7	18.0	16.2	−13	−10	0
Home improvement	56.3	54.7	56.8	53.1	55.2	56.9	4	3	2
Private Nonresidential	130.5	124.9	124.1	126.7	124.9	118.5	−1	−5	−1
Manufacturing facilities	14.3	13.7	14.4	17.2	18.9	19.3	10	2	4
Office	29.7	26.9	27.0	26.6	23.4	19.9	−12	−15	−6
Hotels & motels	7.7	7.4	6.5	7.1	7.5	6.0	5	−20	−8
Other commercial	29.3	29.0	28.9	28.6	27.2	24.5	−5	−10	−4
Religious	2.8	2.8	2.7	2.8	2.8	2.9	0	3	*
Educational	2.4	3.4	2.8	3.1	3.3	3.4	6	3	2
Hospital & institutional	5.6	6.0	7.0	7.0	7.4	7.7	5	5	3
Misc. buildings	2.9	3.2	4.2	3.7	3.6	3.6	−3	0	*
Telecommunications	9.2	9.2	9.7	8.2	8.5	8.5	4	0	3
Railroads	2.9	2.5	2.7	2.5	2.4	2.2	−6	−5	*
Electric utilities	15.6	12.7	10.2	10.6	10.6	10.8	0	2	2
Gas utilities	3.4	3.2	3.4	4.1	4.2	4.4	3	5	*
Petroleum pipelines	0.3	0.4	0.4	0.3	0.3	0.3	0	0	*
Farm structures	2.1	2.5	2.2	2.2	2.3	2.3	3	2	*
Misc. structures	2.3	2.6	2.1	2.7	2.7	2.7	0	0	*
Public Works	85.7	90.7	90.8	91.4	97.0	97.3	6	0	1
Housing & redevelopment	3.2	3.3	3.2	3.6	3.6	3.6	1	−2	*
Federal industrial	1.7	1.5	1.4	1.2	1.3	1.3	7	−2	*
Educational	11.4	11.5	13.7	15.5	17.7	18.6	14	5	2
Hospital	2.4	2.6	2.6	2.3	2.5	2.7	10	5	2
Other public buildings	13.7	14.2	13.9	13.8	15.2	15.6	10	3	1
Highways	24.9	27.0	26.4	27.4	27.7	27.1	1	−2	1
Military facilities	3.9	4.3	3.4	3.3	3.6	3.3	10	−10	−5
Conservation & development	5.0	5.5	4.6	4.6	4.7	4.9	2	4	2
Sewer systems	7.8	9.0	8.3	8.5	8.9	8.5	5	−5	0
Water supplier	3.2	3.7	3.8	3.7	4.1	4.2	10	3	3
Misc. public structures	8.5	8.1	7.5	7.6	7.7	7.7	1	0	*

[1] Estimate.
[2] Forecast.
[3] Average annual rate.

*Long-term forecast not made separately for this category.

SOURCES: U.S. Department of Commerce: Bureau of the Census and International Trade Administration (ITA). Estimates and forecasts by ITA.

Table 2: Construction Expenditures by Type of Structure, 1987–95[1]

(in billions of 1987 dollars)

ITEM	1987	1988	1989	1990[1]	1991[2]	Percent Change 1989-90	Percent Change 1990-91
Total New Construction	410.2	405.2	400.1	394.8	383.5	−1	−3
Building Construction	319.5	318.6	314.5	314.5	307.1	−2	−3
Private residential buildings	194.6	190.3	182.0	172.9	167.7	−5	−3
Private nonresidential buildings	91.9	93.5	96.1	94.0	87.2	−2	−7
Publicly owned buildings	33.0	34.8	36.4	40.3	43.4	+11	+3
Other Structures	90.7	86.6	85.7	87.6	86.9	+2	−1
Private nonresidential	33.0	30.6	30.6	31.0	31.3	+1	+1
Publicly owned	57.7	56.0	55.1	56.7	55.6	+3	−2
Selected Maintenance & Repair:[4]							
Residential[4]	38.2	39.4	39.8	41.0	41.8	+3	+2
Nonresidential Buildings[4, 5]	30.5	31.7	32.9	34.5	35.6	+5	+3
Highway[4]	18.8	19.6	20.1	20.7	21.3	+3	+3
Utility[4]	21.6	22.2	23.1	24.0	25.2	+4	+5
Nonresidential Building Improvements[4,5,6]	52.9	55.3	57.0	59.9	62.8	+5	+5

[1] Estimate.

[2] Forecast.

[3] Average annual rate of growth.

[4] Estimates in constant 1987 dollars were derived by ITA, using current-dollar data developed by the Bureau of the Census using the Census Fixed-Weight Composite Construction Cost Index as the deflator.

[5] Excludes industrial and agricultural buildings, as well as buildings owned by the
Government or private utilities. Also excludes buildings of 1,000 square feet o

[6] Approximately half of all nonresidential building improvements are included in value
construction.

SOURCE: U.S. Department of Commerce; Bureau of the Census and Internationa
Administration (ITA). Estimates and forecasts by ITA.

Classification system (SIC). For other topics related to the subject of this chapter, see chapters 6 and 7.

In contrast to new construction, maintenance and repair work increased in 1990. Although the data for maintenance and repair construction is not as complete as that for new construction, the available information indicates that 1990 was a record year for this type of work. Nonresidential building improvements (commercial remodeling and renovation) also reached record levels (see Table 2). The 1987 Census of Construction found that about 66 percent of the construction industry's work was for new construction; 19 percent was for additions, alterations, and reconstruction; 10 percent was for maintenance and repair; and 5 percent was unspecified.

In 1990, the value of new construction put in place was equal to approximately 8.1 percent of the Gross National Product (GNP). This is well below the post-World War II peak of 11.9 percent of GNP attained in 1966, and slightly better than the cyclical low of 7.7 percent in 1982. By this measure the construction share of GNP is expected to decline in 1990, though this tends to understate the importance of construction in the economy because several types of construction activity that are not included in new construction data have grown rapidly during the past decade. These include maintenance and repair, commercial/industrial renovation, and hazardous waste clean-up.

Construction costs increased by about 2.5 percent during 1990, as measured by the Census Bureau's composite construction cost index. This is about equal to the average annual rate of increase for the past five years, and is substantially less than the rate of increase for the consumer price index. Building materials prices rose an average of 0.5 percent in 1990 (see Chapter 6, "Building Materials".) Land prices, which rose dramatically in some of the strongest construction markets during the 1980s, were more stable in 1990. (Land prices are not included in the construction cost index.) Insurance and bonding costs have continued to increase, although the availability of insurance appears to be better. Labor costs have been relatively steady, with average hourly earnings of construction workers increasing by about 2 percent. Interest rates were about the same as in 1989, but credit standards were much tighter than they had been, espe
for real estate and construction loans.

Construction industry employment in 1990 was a
5.3 million employees. This is about the same as the
level, which was an all-time record. In addition, ove
million people were self-employed as proprietors and w
ing partners. Despite the recent moderation in constru
wage increases, construction remained one of the hig
paying industries, with hourly earnings of $13.55 in
(see Table 3).

INTERNATIONAL COMPETITIVENESS

The construction business has become increasingly i
nationalized during the past 15 years. The value of
construction contracts increased 13 percent to $39.3 bi
in 1989. U.S. international contractors faced stiff co
tition during the 1980s, chiefly from European and Pa

Table 3: Construction: Trends and Projections
1987–91

Item	1987	1988	1989	1990[1]
Value of new construction put in place (bil. $)	410.2	422.1	432.1	445
Value of new construction put in place (bil. 1987 $)	410.2	405.2	400.1	394.8
Number of private housing units (000)	1,621	1,488	1,376	1,250
Shipments of mobile homes (000 units)	244.7	232.6	198.1	188.0
Employees (000)[3]	4,967	5,125	5,300	5,300
Self-employed workers (000)[4]	1,397	1,450	1,420	1,400
Average hourly earnings of construction workers ($)[3]	12.71	13.01	13.37	13.55
Composite construction cost index (1987=100.0)	100.0	103.8	107.2	110.0
Producer price index for all construction materials (1982=100.0)	105.9	115.7	119.5	120.1

[1] Estimate.

[2] Forecast.

[3] Based on establishment surveys by the Bureau of Labor Statistics. Excludes self-em
workers.

[4] Proprietors and working partners, not counted as employees.

SOURCES: U.S. Department of Commerce: Bureau of the Census and Internationa
Administration; Bureau of Labor Statistics. Estimates and forecasts by ITA.

Note: The data on new construction put in place do not include maintenance an
work.

Rim firms. Although U.S. firms lost considerable market share during most of the decade, the value of international contracts won by U.S. firms has increased during the last three years. Unfortunately, the invasion of Kuwait has thrown the important Middle Eastern market into turmoil, seriously affecting trends in 1990 and 1991.

Many of the world's largest foreign construction contractors entered the U.S. construction market during the 1980s and are becoming a significant factor in nonresidential construction. Most of these contractors have entered the U.S. market by buying American construction companies, but some of the largest foreign contractors have established branch operations in the United States. Foreign-owned construction firms won approximately $15.5 billion in U.S. construction contracts in 1990, up from $3.6 billion in 1982. They accounted for approximately 6 percent of all construction contracts awarded in the United States during 1989. Most of these foreign entrants are based in Germany, the United Kingdom, Japan, and France, although nearly a dozen additional nations are represented.

International trade and capital flows have become important factors in the domestic construction market. Because of record levels of foreign investment in the United States, an increasing share of U.S. construction projects are being built for foreign owners. Foreign direct investment in the United States is chiefly in manufacturing facilities, warehouses, office buildings, and hotels. Foreign financial investments, such as U.S. government bonds and mortgage-backed securities, have greatly benefited U.S. construction demand by keeping interest rates lower than they would have been otherwise. On the other hand, the large foreign trade deficit is reducing industrial construction by as much as $2 billion annually, by limiting the need for new U.S. manufacturing facilities.

Outlook for 1991

The total value of new construction in 1991 will decline from the 1990 value, with substantial declines likely for most types of commercial construction (see Table 1). The most promising markets appear to be home improvement, manufacturing facilities, hospitals, schools, water supply, and public service buildings. The weaker construction markets will be office buildings and military facilities.

The detailed prospects for each type of construction are discussed in later sectors of this chapter. However, several broad economic factors will effect construction demand in 1991. Interest rates are expected to increase slightly, while real-estate finance will be characterized by weak asset prices and lender wariness. Eonomic growth is expected to be relatively weak in 1991, while projections indicate that plant and equipment expenditures will increase slightly because of export demand and the need for plant modernization. Vacancy rates for apartments and commercial buildings will remain high, depressing the demand for new construction. Government investment will likely keep pace with inflation in 1991, and demographic factors are bullish for construction of schools and hospitals, but bearish for apartments.

The number of housing starts will be about 1.15 million units in 1990, 6 percent less than the 1990 level, although the value of residential construction will not decline as sharply because home improvement work will probably increase slightly. Private nonresidential construction will continue to decline, primarily because of high vacancy rates for commercial buildings and the difficulty of obtaining financing for commercial real estate investment. Public works construction will level off in 1991, as modest increases in State and local spending offset small declines in Federal construction expenditures.

Construction activity is likely to hold up better in the Midwest and the South than in the Northeast and the West. The Midwest may even reverse the national pattern and enjoy an increase in construction, because of the revival of manufacturing output and plant investment. Numerous jurisdictions, especially in the Northeast and California, have adopted antidevelopment policies that raise costs and otherwise inhibit new construction. The South has received a disproportionate share of industrial construction during the past two decades, and will probably benefit from the narrowing trade deficit.

Long-Term Prospects

During the 1990-95 period, new construction is expected to remain near the current levels, while remodeling and repair construction will increase steadily (see Table 2). The macroeconomic forecast expects less than 2 percent average annual growth in GNP over the five-year period, and construction is expected to underperform GNP. Given this macroeconomic scenario, the overall value of new construction should decline in 1991 and 1992, before recovering to current levels by the mid-1990s.

The growth rates for new construction are likely to be significantly lower than overall GNP growth rates during the next five years. In part the slower rate is due to the current oversupply of commercial buildings, which will be gradually absorbed by a growing economy. High "real" interest rates will also inhibit construction, especially single-family homes. The Federal budget deficit will limit spending for public works, despite the well-publicized need for additional infrastructure investment.

The recovery of the U.S. manufacturing sector is expected to continue into the long term, with one result being strong demand for industrial construction. Hospital construction will continue to gain because of demographic and institutional factors. Maintenance and repair work, both residential and nonresidential, are expected to increase more rapidly than the overall economy, as the U.S. stock of structures becomes older and more extensive.

The commercial real estate slump is likely to persist for several years, and commercial construction is unlikely to recover to its current levels before 1995. Real estate development has historically been a "boom-and-bust" business, and the current downturn has been exacerbated by the record collapse of hundreds of financial institutions. High vacancy rates and weak building prices have made new construction unprofitable in most situations, and lender reluctance to extend real estate loans has further limited opportunities.

The U.S. construction industry will face a number of supply-side challenges during the next five years in addition to market factors. Among these are foreign competition, supply of workers, and liability insurance. Most of the foreign construction contractors who are entering the U.S. market are extremely well-financed and often possess construction expertise equal or superior to most U.S. builders. The supply of young workers available to the construction industry will dwindle because of demographic trends and low unemployment rates. Unless there are substantial productivity gains, labor shortages and labor quality could become major problems. The cost of liability insurance has stabilized, but long-run trends in liability insurance are largely dependent on legislative and judiciary developments in tort reform.—*Patrick MacAuley, Office of Forest Products and Domestic Construction, (202) 377-0132, September 1990.*

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PRIVATE RESIDENTIAL CONSTRUCTION

The value of private residential construction fell 5 percent in 1990. The 1990 value was $195 billion in current dollars, of which 58 percent was for new single-unit homes, 10 percent was for multiunit homes, and 32 percent was for improvements to existing homes. Housing starts fell 12 percent, from 1.38 million in 1989 to 1.22 million in 1990, with declines occurring in both single and multiunit structures. Residential construction accounted for 3.5 percent of the $5,500 billion Gross National Product in 1990.

Interest rates on conventional 30-year single-family fixed-rate mortgages stayed within a narrow band during 1990, and averaged 10.4 percent for the year. The maintenance of interest rates above 10 percent for most of 1990 was a major factor in depressing new home sales 13 percent below 1989 levels. The sales volume of existing homes also fell 2 percent below the previous year.

Income levels and housing prices are the two most important factors in housing affordability. Between 1982 and 1990, median new home prices rose 83 percent while disposable income per capita increased by only 22 percent. Between 1983 and 1987, declining interest rates more than offset rising home prices, but beginning in 1988 both housing prices and interest rates rose, thereby reducing affordability.

The affordability of housing will continue to play a significant role and have major implications for the size and design of housing in the future. In a report recently issued by the Joint Center for Housing Studies at Harvard University entitled "The State of the Nation's Housing 1990," the authors conclude that "the housing affordability crunch will continue through the 1990s with the major impact of continued high home prices falling on first-time buyers and low- and moderate-income renters."

Outlook for 1991

The number of private housing starts in 1991 is expected to continue the sharp decline observed in 1990 to reach a level of about 1.15 million units. Mortgage interest rates are expected to increase by about 0.25 percent in 1991, to an weighted average effective rate of 10.6 percent (see Table 4). Home improvement expenditures will increase 3.0 percent over 1990, below the 4.0 percent increase in 1990 and still considerably below the rapid growth rates of the mid-1980s.

Long-Term Prospects

Homebuilding is expected to grow more slowly than the overall economy during the next five years, as homeownership continues to decline in the face of escalating home prices and relatively high mortgage rates. Demographic

Table 4: Number of Housing Starts and Major Determinants of Housing Demand, 1980–91

Year	Total Housing Starts (thousands of units)	Average Annual Effective Interest Rates on Conventional Mortgages of 25 Years with 75 Percent Loan-to-price, Ratios (percent)[2]	Single-Family Home Median Sales Price ($000)	Index of Amenities in Average New Single-Family Home (1982 = 100)[1]	Population millions		Per capita Disposable Personal Income (1982 dollars)[5]
					Total	25–44 Years	
1980	1,292	14.0	64.6	103.0	227.8	63.4	9,722
1981	1,084	16.7	68.9	102.3	230.1	65.6	9,769
1982	1,062	16.6	69.3	100.0	232.5	67.9	9,725
1983	1,703	13.3	75.3	103.9	234.8	70.0	9,930
1984	1,750	13.1	79.9	108.9	237.0	72.1	10,419
1985	1,745	12.0	84.3	109.3	239.3	74.1	10,625
1986	1,807	10.3	92.0	117.0	241.6	76.1	10,970
1987	1,623	9.7	104.5	130.0	244.0	77.9	10,970
1988	1,488	9.7	112.5	141.0	246.4	79.1	11,340
1989	1,376	10.1	120.0	148.0	248.3	80.5	11,670
1990[3]	1,220	10.4	127.0	148.0	250.0	81.0	11,850
1991[4]	1,150	10.6	138.0	149.0			

[1] The price index of amenities measures trends in house size and nine other amenities, such as number of bathrooms, air conditioning, fireplaces, and size of lot.

[2] Includes both fixed rate and variable rate mortgages. Effective annual rate includes amortized cost of "points" and other loan origination charges.

[3] Estimate.

[4] Forecast.

[5] Bureau of Economic Analysis.

SOURCES: U.S. Department of Commerce: Bureau of Census and International Trade Administration (ITA); Federal Home Loan Bank Board. Population estimates by Census Bureau. Remaining estimates and forecasts by ITA.

factors will continue to influence multifamily housing, as will the newly enacted Financial Institutions Reform, Recovery, and Enforcement Act (FIRREA) which limits the amount of acquisition, development, and construction lending by financial institutions. As a result, apartment builders' ability to find construction loans will be limited, and loan costs may also be higher. Congressional passage of the Fair Housing Act of 1988 will also influence multifamily housing. The Act, implemented by the Department of Housing and Urban Development, requires that a certain portion of apartments in newly constructed buildings be made accessible to the handicapped. The range of modifications required are expected to increase costs and reduce overall profit margins for these projects.

While falling rental vacancy rates suggest an end to the vacancy glut of the early-mid 1980s, the impact of demographics, FIRREA, and HUD regulations will continue to depress the multifamily housing sector through the mid 1990s. Expenditures for home improvement and repair are expected to remain strong throughout the 1990s as the housing stock ages and as homeowners "upgrade" their existing houses.

Single-Unit Structures

In 1990, private single-unit housing starts totaled 900 thousand units, down 10 percent from the approximately 1.0 million units in 1989. The average amenities of new homes was unchanged from 1989, as shown in Table 4, while the median sales price of a new single-family home increased nearly 6 percent during the period, to $127,000. The 1990 decline in housing starts was primarily a continuation of the conditions that created the 1989 decline, the increase in interest rates in 1988 and 1989, and the continuing large increases in home prices that outweighed salaries and reduced even further the affordability of housing to first-time buyers. In 1991 single-family housing starts will continue to decline as the slowing economy and high mortgage rates discourage major consumer purchases.

Of the 900,000 starts of single-family homes in 1990, 840,000 were detached houses and 60,000 were townhouses. An additional 25,000 townhouse-style homes built in 1990 were classified as multifamily housing. While in previous years single-unit structures have accounted for an increasing portion of total housing starts, the data for 1988 and 1989 suggest that the rate of increase may be slowing and that the ratio may stabilize in the 72-74 percent range. If true, this would indicate that 25-30 percent of people select multifamily homes for reasons of either affordability, easier maintenance, safety, or simply to escape the ever-higher property taxes imposed on single-family dwellings by State and local taxing authorities.

The supply of used starter homes should increase slowly in the 1990s as the trend to "trading-up" into larger houses continues and as certain segments of the population (retirees, single parents, young professionals, etc.) move into multifamily dwellings. However, the availability of starter homes will increase more slowly than the overall economy, and this will only marginally help those new family formations aspiring to home ownership. As pointed out previously, the housing affordability crunch will continue through the 1990s and will impact primarily first-time buyers and low- and moderate-income renters. With the added impact of high-interest rates during the period, the future total value of residential construction put in place is expected to increase slowly, with an increasing percentage of this total in the home-improvement category.

Multiunit Housing

Multiunit housing consists of two-to-four unit structures, some townhouse-style buildings with more than five units, and apartment buildings, as shown in Table 5. Apartment buildings accounted for 77 percent of multiunit housing starts in 1990.

In 1990, about 320,000 multiunit residential structures were started, representing an 14 percent decline from the 1989, and a 52 percent decline from the 670,000 multifamily housing starts in 1985. Multifamily housing starts are expected to continue declining in 1991.

Multiunit structures were an increasing portion of total housing starts from the mid-70s until the mid-80s stimulated by generous tax incentives. The resulting glut of apartment buildings coupled with the 1986 tax reform law

Table 5: Private Housing Starts, by Type of House, 1980-91

(in thousands of units)

Year	Total Starts	Single-unit Structures			Multi-unit Structures			
		Total	Detached Houses	Townhouses[1]	Total	2- to 4-Unit Structures	Townhouses[1]	Apartment[2] Units
1980	1,292	852	774	78	440	110	45	285
1981	1,084	705	628	77	379	91	39	249
1982	1,062	663	577	86	400	80	27	293
1983	1,703	1,068	897	171	635	113	44	478
1984	1,750	1,084	875	210	666	121	40	504
1985	1,745	1,075	905	170	670	93	53	524
1986	1,807	1,179	1,013	166	628	84	52	492
1987	1,623	1,146	1,004	142	477	65	35	377
1988	1,488	1,081	968	113	407	59	30	318
1989	1,376	1,003	916	87	373	55	31	287
1990[3]	1,220	900	840	60	320	50	25	245
1991[4]	1,150	855	805	50	295	50	20	225

[1] A single-unit townhouse is one which is separated from adjoining units by a ground-to-roof wall and has it own separate utilities. Townhouse apartments, though attached, are not separated by a ground-to-roof wall, and they may share infrastructural facilities.

[2] Apartment buildings are conventional multifamily buildings in which dwelling units may share a common basement, heating plant, stairs, entrance halls, water supply, or sewage-disposal facilities.

[3] Estimate.

[4] Forecast.

SOURCES: U.S. Department of Commerce, Bureau of Census; estimates and forecasts prepared by the International Trade Administration.

and a slump in many local economies resulted in a decreasing percentage of multiunit structures as a proportion of total housing starts through 1987. In 1989 and 1990 this level appeared to stabilize in the 26–27 percent range. If true, this would indicate that 25–30 percent of those seeking housing would choose multifamily homes for reasons of affordability, less maintenance, a generally safer living environment, or simply to escape ever-increasing property taxes imposed on single-family dwellings by State and local taxes. Multiunit construction is likely to continue to decline in 1991.

Although vacancy rates are declining, there are a number of factors that will influence the future availability of multifamily housing. These include the restricted availability of funds for developers under the recently enacted Financial Institutions Reform, Recovery, and Enforcement Act (FIRREA), which limits the amount of acquisition, development, and construction lending by financial institutions. The Fair Housing Act of 1988 that requires a certain portion of apartments in newly constructed buildings to be made accessible to the handicapped and declining numbers of Americans in the 18-to-25-year-old age group are also important factors that are expected to contribute to the overall reduced importance of multifamily housing through the mid 1990s. This trend may be offset somewhat if the percentage of multifamily homes stabilize in the 26–27 percent range as a result of selected market segments (such as single parents, professional couples, and the elderly), choosing the various advantages of multifamily housing.

While low appreciation and a high inventory of unsold units has slowed the pace of condominium construction in recent years, the enactment of the 1986 tax reforms has made condominium ownership much more attractive.

Manufactured Housing

Manufactured houses (formerly called mobile homes) are purchased mainly by first-time buyers, rural residents, the elderly, and nontraditional households. Although growth of the traditional market of first-time home buyers in the 25–44 age range is slowing, there is an increasing potential market of retired people of moderate and low incomes.

There were 186,000 manufactured housing units shipped in 1990, valued at approximately $3,752 million dollars. This represents a decline of over 6 percent from 1989 when 198,100 units were shipped. Manufactured housing continued to account for about 13 percent of new additions to housing (manufactured housing shipments plus private housing starts) in 1990. This represents a share similar to that held by the industry during the 1980s but considerably below the more than 20 percent share held in the late 1960s and early 1970s.

During the same period, the mix of the single- and multiwide units changed. During the 1980–82 economic downturn, the percentage of double-wide homes shipped declined from 28 percent in 1980 to 22 percent in 1982. During the balance of the 1980s the percentage of multiwide manufactured homes rose steadily and by 1990 they accounted for nearly 46 percent of total shipments.

Reasons for the overall downturn in total shipments include a continuing decline in the number of units shipped to the economically depressed oil-producing South Central states, the second largest regional market for these units. Also, manufactured housing is a low-cost and starter-home option, and the number of first-time home buyers in the 25–44 age range continues to decline. Finally, most manufactured home purchases are credit-financed. Although manufactured homes qualify for mortgage financing, 90 percent are financed by revolving retail credit with the other 10 percent financed with mortgages. These credit interest rates are typically 2 to 3 percentage points higher than new mortgage rates, creating an additional disincentive to the purchase of manufactured homes.

Since 1982, average new single-family home prices (including land) have appreciated more than 75 percent, while manufactured home prices rose 38 percent. Much of the appeal of manufactured housing is the lower price to the consumer. Manufactured homes account for an estimated 80 percent of housing costing less than $50,000. The average price of a manufactured home in 1990 was $27,100, compared to $19,700 in 1982.

In 1991, manufactured home shipments are expected to total about 176,000 units, representing a further 5 percent decline from 1990. This forecast recognizes that interest rates on mortgages and low consumer credit will increase, thus exacerbating even further the difficulties faced by first-time home buyers. Note, however, that if the Middle-Eastern conflict continues for an extended period, higher oil prices could give an economic boost to the South Central states that, in turn, could stimulate the region's demand for manufactured housing.

Residential Upkeep and Improvement

Upkeep and improvement includes expenditures on maintenance and repairs as well as new construction improvements, but does not include the value of do-it-yourself labor. Maintenance and repairs are defined as property maintenance costs, including activities such as painting and appliance parts replacement and repair. These costs are not included with New Construction Put in Place as shown in Table 1, but are shown in Table 2. Major replacement items and additions and alterations are classified as "construction improvements," which include major changes inside and outside of existing residential structures, as well as large individual expenditures for items such as water heaters, furnaces, etc.

Expenditures for upkeep and improvement of residential properties in 1990 were $106 billion, a 5.0 percent increase over the 1989 total of $100.9 billion. As with new housing, the mid-1980s were strong growth years for this sector. Lower interest rates and the 1986 tax law changes created opportunities for homeowners to refinance their homes, thus increasing their mortgages and realizing liquidity for remodeling. In 1990, expenditures by owners for upkeep and improvement of residential properties slowed, reflecting the country's slower economic growth, higher interest rates, and weaker consumer confidence levels.

While essential maintenance and repairs showed considerable growth, major replacement items continued at 1989 levels and the more discretionary expenditures on additions and alterations declined sharply. Residential upkeep expenditures for owner-occupied units will increase only modestly in 1991, reflecting continued consumer caution in the face of a forecast downturn in the economy. In the long run, sales by stores oriented toward the do-it-yourself home improvement market will continue to grow steadily because of the increasing size and age of the existing housing stock. On the downside, the preliminary trend toward increased multifamily living (which minimizes house and yard maintenance) could provide an attractive alternative for those who no longer have the time or the inclination for remodeling and maintenance.—*Patrick D. Cosslett, Office of Forest Products and Domestic Construction, (202) 377-0132, September 1990.*

PRIVATE NONRESIDENTIAL CONSTRUCTION

In 1990, the constant-dollar value of new private nonresidential construction was about 1 percent less than the 1989 value, but was nearly 10 percent below the record set in 1985. Of the total $142 billion, $105 billion was for buildings and $37 billion was for other structures. The declines were most severe for office buildings, other commercial buildings, and railroads. The South and West accounted for about 60 percent of total nonresidential construction, although the Midwest was the only region that increased in 1990. The Northeast experienced the sharpest drop, as measured by percentage declines in building permits.

The weakness in nonresidential construction reflects a downturn in the phenomenal commercial building boom that peaked in 1985. The unprecedented amount of commercial construction during 1983-90 has resulted in record vacancy rates for office buildings, stores, hotels, and warehouses. These high vacancy rates will depress the demand for new construction for several years, until supply and demand for commercial space are brought into balance.

Commercial real estate has been especially hard hit by the crisis in the savings and loan industry. The collapse of hundreds of lending institutions has removed many of the most aggressive lenders and investors, and most of the remaining institutions have become wary of new real estate loans. This restriction in credit to the real estate industry is reducing asset prices and further restricting demand for new construction.

Outlook for 1991

New private nonresidential construction will decline by about 5 percent in 1991, despite the expected growth in GNP and total business investment. While business plant and equipment expenditures are expected to increase slightly in 1991, all of the increase will be in capital equipment rather than in buildings and other structures. This is primarily because of overcapacity in some of the most structure-intensive sectors of the economy, such as commercial real estate and electric utilities. The largest declines will be in commercial construction—especially office buildings and hotels—where capacity surpluses are greatest.

In contrast to the weak outlook for new construction, the nonresidential repair and renovation markets will probably remain growth markets for the next five years. In particular, electric utilities and commercial building owners are likely to increase their maintenance and repair expenditures. Nonresidential building improvements will remain at high levels, although the rapid growth rates of the 1980s are probably over (see Table 2).

Long-Term Prospects

Total private nonresidential construction is likely to decline over the next five years, given high vacancy rates for commercial buildings, continued liquidation of failing thrift institutions, and the relatively modest five-year macroeconomic forcast. However, the decline will be entirely caused by the slump in commercial construction—industrial, utility, and hospital construction will probably increase during the period.

The need to modernize existing U.S. capital stock will provide strong underlying demand for new construction, as well as for repair and renovation construction. Although most modernization expenditures tend to be for new capital equipment rather than for buildings and other structures, nevertheless the amount invested in structures will be large. The repair and renovation market is likely to be stronger than the new construction market during the next five years (see Table 2).

Manufacturing Facilities

The constant-dollar value of industrial construction put in place increased nearly 10 percent in 1990, and will remain at high levels in 1991 because of high capacity utilization rates in many manufacturing industries. However, the rate of increase will drop off because of poor corporate profits and slower economic growth.

Although international trade competition is depressing the need for U.S. industrial construction, this will be less of a factor in the 1990s. It is estimated that the 1990 trade deficit in manufactured goods of about $80 billion will reduce the annual amount of construction of U.S. manufacturing facilities by about $2 billion. If the trade deficit continues to be reduced by surging U.S. exports, industrial construction will benefit from the easing of this depressant.

Although the long-term outlook for industrial construction is subject to many uncertainties, it is likely to be one of the stronger construction markets during the next five years. Because the U.S. economy and U.S. exports are expected to improve during the period, the economic climate should be very favorable for industrial construction. Among the negative factors in the long-term outlook are uncertainty about the economy, poor corporate profitability, and heavy debt loads carried by many companies.

The need to modernize the stock of existing buildings and other structures will help support higher levels of industrial construction. Since the 1970s, the tendency has been to defer replacement of manufacturing plants. The cost of replacing the manufacturing structures that existed in 1983 is estimated at $490 billion in 1989 dollars, which indicates a potentially huge demand. The extent to which manufacturing plants will be modernized or replaced depends on a host of factors, such as U.S. international competitiveness, interest rates, business profitability, technological developments, and economic growth.

Office Buildings

Office construction in 1990 was 20 percent below its record levels reached in 1985. Further declines are expected in 1991 and for several years thereafter, because of high vacancy rates, slower growth in white-collar employment, and poor financial conditions in the real estate industry.

HOME OF
AKRON FURNITU
Charge

Goodyear

Workers finish installing a new roofing system using hot asphalt. Expenditures for commercial building improvements will remain at high levels in 1991.

Nevertheless, a sizable amount of office construction will continue because of strength in a small number of cities and market niches, as well as continued interest from institutions and long-term investors.

The growth in white-collar employment slowed sharply in 1990, even as large amounts of new office space came onto the market. As a result, office vacancy rates have remained very high and rents have been falling. In 1991 white-collar employment may not increase at all because of slow economic growth and corporate cost-cutting. Over the next five years, growth in white-collar employment is likely to slow for demographic reasons, which will tend to keep vacancy rates high despite the slowdown in construction. In combination with the severe financial problems facing many office building developers, it is probable that office construction will continue to decline sharply in the early 1990s.

The office renovation business has fared much better than new office construction in recent years. By 1990 expenditures for office renovation were about equal to new office construction put in place. Much of the rapid growth in this market segment was the result of overbuilding, which compelled the owners of existing buildings to upgrade their buildings in order to retain tenants. Although expenditures for office remodeling are likely to remain at high levels, the era of rapid growth is largely over, because of tight financial conditions in the real estate industry.

Hotels and Other Commercial Buildings

Construction of hotels and motels increased in 1990, reflecting an international hotel building boom that has probably peaked in the United States. A 20 percent decline is likely in 1991, and an additional decline in 1992, in order to bring capacity more in line with market demand. Fortunately, the underlying demand for hotel lodging is expected to grow steadily in the next several years, helping to support construction beyond 1992 (see Chapter 59, "Hotels", for a discussion of the hotel industry's prospects).

The category "Other Commercial Buildings" consists of commercial buildings other than office buildings and hotels; it includes warehouses, grain elevators, shopping centers, parking garages, banks, fast-food restaurants, and gas stations. In recent years, shopping centers have accounted for about half of the value of construction work in this category and warehouses for about a fourth.

The value of other commercial construction declined in 1990, and will decline again in 1991. The primary causes of the downturn are overcapacity and the shakeout underway in the retailing industry. However, the overbuilding problem is not as serious for stores and shopping centers as it is for office buildings and hotels. Other commercial construction will probably begin to recover by 1993, as the overall economic recovery results in greater retail sales and growing requirements for store space.

Construction of service stations and auto repair garages has declined from the record set in 1987, but will remain at current levels or even increase in the early 1990s. The auto service business has benefited from the increasing complexity of automobiles and the increasing proportion of older cars, which need more maintenance. Although the number of gasoline stations will probably continue to decline, many of the remaining stations are investing large amounts in construction to become high-volume sales outlets, convenience shops, or specialized service stations. Economic and demographic forecasts for the next five years indicate further increases in the number of vehicle-miles driven and increases in the demand for auto service and repair.

Private Electric Utilities

The inflation-adjusted value of electric utility construction dropped by 47 percent during the 1980s, but the decline appears to have leveled off. Electric utility construction will probably increase slightly in 1991, beginning a recovery that should last through the first half of the 1990s. This category of construction includes new power plants, transmission lines, pollution control facilities, conversion of existing power plants from oil and gas to coal, and modernization of existing power plants and other buildings.

Very few new power plants were started during the 1980s. The two principal reasons for this were the fairly widespread surplus of generating capacity and the utilities' reluctance to undertake the financial risk of a new construction program, even where there was a forseeable shortage of generating capacity. The surplus capacity is steadily disappearing and shortages are likely in some areas during the early 1990s. There will probably be a quickening in the pace of new power plant starts, but utilities are unlikely to repeat the massive construction expansion that occured during the 1970s. The financial risks of new power plant construction have grown dramatically during the past decade because of changing regulations, nuclear power disasters, lawsuits, Wall Street disfavor, the 1986 tax reform act, and recent rulings by state regulators against passing on to consumers the costs of canceled construction projects.

Several segments of the electric power construction market that prospered in the 1980s will continue to do well in the 1990s—transmission facilities, "retrofits" of existing power plants, and pollution control systems. Retrofit of existing power plants to improve efficiency and extend generating life involves much less risk and requires fewer permits than does "greenfield" construction. Utilities will continue to invest heavily in transmission systems, in order to accomodate growth and make optimum use of existing power plants. Pollution control spending will increase because of tightening environmental restrictions and a Federal Government program to subsidize clean coal technology.

Expenditures for maintenance and repair of electric utility systems have grown rapidly and are almost as large as new construction expenditures (see Table 2). These expenditures will continue to grow rapidly in the 1990s as the average age of operating power plants increases and as the operations become more complex.

Hospital and Institutional

Hospital and institutional construction includes hospitals, outpatient clinics, nursing homes, convalescent homes, orphanages, and similar institutions for prolonged care. Buildings that are primarily used as doctors' offices are classified as office buildings. Approximately 70 percent of the value of this construction is for hospitals and clinics, while the remaining 30 percent is for nursing homes and similar facilities. A noteworthy feature of hospital and institutional construction is that 70 percent of the value is for additions and modernizations at existing facilities, while only 30 percent is for new facilities. About 75 percent of this construction is for privately owned facilities and 25 percent for publicly owned facilities.

Construction of health-care facilities increased by 5 percent in 1990 and will continue to gain in the 1990s. The mid-1980s slump in health-care construction was largely attributable to a major effort by government and industry to contain health insurance costs. Although this cost-containment effort continues, most of the effects on construction were one-time reductions in the level of infrastructure needed. The current upswing in construction reflects the return to the long-term upward trend in the health-care sector.

The most important factor in the longer term outlook for hospital and institutional construction is the rapid increase in the number of elderly Americans, who generally require far more hospital and nursing home care than younger people. Additional factors that will support health-care construction are increasing use of new sophisticated medical treatments, the need for additional clinics for drug addicts, the increasing number of AIDS patients, the need to modernize in order to attract paying patients, and scarce health-care personnel. Negative factors in the otherwise bullish outlook for health-care construction include the poor fiscal condition of those hospitals with large proportions of charity patients, as well as the possibility that shortages of nurses may lead many hospitals to defer expansion plans. Because publicly owned hospitals are less able to cope with these negative factors, construction is expected to lag behind privately owned hospitals.—*Patrick H. MacAuley, Office of Forest Products and Domestic Construction, (202) 377-0132, September 1990.*

PUBLICLY OWNED CONSTRUCTION

The value of publicly owned construction put in place rose by 6 percent in 1990, led by gains in schools, water and sewer facilities, and urban redevelopment. Nearly all categories of public works construction increased over 1989 levels (see Table 1). The total value of publicly owned construction in current dollars was about $108 billion, of which $30 billion was for highways and bridges.

Public works construction has increased substantially since 1983, but it is still below the record level reached in 1968. In part this recovery in public works represents a commitment to reverse the decline in U.S. infrastructure conditions and in part it is a cyclical phenomenon. The general economic recovery improved the ability of State and local governments to finance construction. In addition, the fairly rapid pace of residential and commercial construction has also required building a considerable amount of related infrastructure, such as roads, water and sewer lines, schools, and fire stations. Also, the public appears to be more willing to pay for infrastructure improvements, based on the high approval rates for public works bond issues.

Three infrastructure-related laws that were approved in the late 1980s will have significant long-term effects on public works construction. The Water Resources Act of 1986 authorized 181 new water resources construction projects—the first since 1977—and provided for cost-sharing reforms. As a result, construction of dams, canals, harbors, navigation improvements, irrigation systems, and flood control projects will remain at high levels for the next decade. The Clean Water Act of 1987 provides up to $3 billion annually for sewage system construction over five years. The Surface Transportation Assistance Act of 1987 extends the Federal-aid Highways program for five years, at approximately the 1986 level. This program is funded from the Highways Trust Fund at approximately $14 billion annually, and is by far the largest public works program in the United States.

Outlook for 1991

The value of publicly owned construction will increase slightly, if at all, in 1991. The biggest gains will probably be in schools, hospitals, and other public buildings. Highway construction will decline slightly. The biggest declines will be in military construction and sewer systems.

The flat outlook for public works construction is the result of several offsetting developments, including a 5-percent decline in Federal infrastructure and spending, and sharp reductions in infrastructure paid for by private developers. However, proceeds from municipal bond sales for infrastructure purposes (1988 to 1990) are up sharply, and current revenues available for public works (especially gasoline taxes and tolls) will increase faster than costs.

Long-Term Prospects

Public works construction will increase modestly during the 1990–95 period, given the macroeconomic forecast of modest economic growth and fairly stable interest rates. Under these conditions, State and local governments could increase their expenditures enough to offset the expected declines in Federal construction expenditures. Although several State and local governments are undertaking dramatic new infrastructure initiatives, most States appear unlikely to undertake massive increases in construction spending, and some states are actually scaling back public works spending for budget reasons.

Maintenance and repair spending will probably increase faster than new construction spending, as the public works infrastructure steadily becomes older and larger. While increased maintenance and repair expenditures will provide work for certain types of contractors, they will often consume funds that could have been spent on new construction.

BASF Corp

Two men lift blocks in Colorado highway stabilization project. Public works construction will increase moderately over the next five years.

Efforts to control the Federal budget deficit will probably prevent the Federal government from undertaking massive infrastructure renewal initiatives. The five-year Federal budget calls for capital spending to decline substantially in inflation-adjusted terms. In contrast, OMB's "baseline" estimate indicates a more modest decline in real investment spending by the Federal government (see Table 6). Nevertheless, recent Congressional actions have shown that there is strong support for the remaining Federal public works programs. By the mid-1990s it may be possible to provide substantial amounts of new Federal funds for construction, financed by innovative techniques, increased user fees, or diversion of spending from nonconstruction programs.

Highway construction will probably decline during the early 1990s, unless there is another increase in Federal motor fuel taxes or a decision to draw down the Highway Trust Fund. Water resources and marine construction are expected to increase substantially because of the Water Resources Act of 1986, which authorized 181 new construction projects. Water and sewer construction will remain at high levels, but will not increase much after 1990. Construction of schools and other public buildings will probably increase throughout the period, although at a slower rate than during the past 5 years. Military construction probably peaked in 1987, and will likely decline for several years. The level of Federal industrial construction will depend in large part on prospects for the $8.2 billion Superconducting Supercollider (SSC) planned for a Texas site.

Highways and Bridges

New road and bridge construction increased slightly in 1990, and will probably decline slightly in 1991 (see Table 1). Public spending for highway construction has been flat since 1988, and increasing costs have reduced the actual amount of construction that can be purchased. Expenditures for highway maintenance have continued to increase, partly at the expense of new construction. This trend will probably continue into the mid-1990s.

Table 6: Projections of Outlays for Federal Investment: Baseline and Presidential Policy

(in billions of dollars)

	Actual	Estimated	Forecast				
	1989	1990	1991	1992	1993	1994	1995
In current dollars:							
Baseline:							
Nondefense	53.8	57.9	62.0	65.3	66.5	67.5	68.4
National defense	5.6	5.7	5.3	6.1	6.3	6.4	6.6
Total	59.4	63.6	67.3	71.4	72.8	74.0	75.0
Presidential policy:							
Nondefense	53.8	57.9	61.4	62.7	61.3	60.1	58.2
National defense	5.6	5.7	5.2	5.9	6.2	6.0	6.4
Total	59.4	63.6	66.6	68.7	67.4	66.0	64.0
In constant 1982 dollars:							
Baseline:							
Nondefense	48.0	49.6	50.9	51.5	50.3	49.3	48.2
National defense	5.4	5.3	4.7	5.2	5.2	5.1	5.1
Total	53.4	54.9	55.6	56.7	55.5	54.4	53.4
Presidential policy:							
Nondefense	48.0	49.6	50.4	49.5	46.5	44.0	41.2
National defense	5.4	5.3	4.6	5.1	5.1	4.8	5.0
Total	53.4	54.9	55.0	54.6	51.6	48.8	46.2

Note: Includes outlays that are off-budget under current law and are proposed to be included on-budget. Also includes some investment other than construction, such as land acquisition and major civilian equipment.

SOURCE: U.S. Office of Management and Budget: *Budget of the United States Governments*, FY 1991.

The Surface Transportation Assistance and Uniform Relocation Act of 1987 renewed the Federal-aid Highways program until 1992, providing a total of about $80 billion for highway construction over 5 years. The Act increased Federal outlays by raising the obligation ceiling slightly, by partially funding 152 new demonstration projects, and by providing a more generous minimum allocation formula. Unlike the landmark 1982 Surface Transportation Assistance Act, the 1987 Act does not provide a massive increase in construction funding, and the real value of Federal highway spending may actually decline over the 1988-92 period. Legislation to renew the Federal-aid Highways program will be before Congress in 1992, and this will probably be the most important decision affecting highway construction in the 1990s.

In the longer term, highway construction expenditures will probably continue to increase in order to prevent a decline in the condition of the nation's highway infrastructure. Any sustained increase in Federal funds would require an Act of Congress, but the large balance in the Highway Trust Fund can accommodate a substantial surge in expenditures. Although State governments in the aggregate have not increased road construction spending at a pace much faster than the inflation rate, several states have committed themselves to massive road-building programs. Recent actions in California may indicate a trend—voters approved hefty gasoline tax increases to fund billions of dollars in road improvements, while the legislature has approved four toll roads.

In 1990, approximately 25 percent of the value of highway construction put in place consisted of bridges, overpasses, and tunnels, while flatwork accounted for 75 percent. Bridge work is expected to grow faster than flatwork during the next several years because of the need to replace obsolete or unsafe bridges. According to the Federal Highway Administration, 23 percent of the highway bridges in the United States were structurally deficient and an additional 21 percent were functionally or structurally obsolete.

Highway maintenance and repair expenditures have grown during the past two decades as the road network has become larger and older. The 1990 current-dollar cost of highway maintenance and repair was about $23 billion, compared to the $30 billion value of new highway construction put in place. While some of this work was routine maintenance such as mowing grass, much of it was typical construction activity such as repaving roads and painting bridges. Highway maintenance and repair expenditures will probably grow more rapidly than new construction over the next decade (see Table 2).

Sewer Systems

The constant-dollar value of sewer system construction put in place increased slightly in 1990, and was about 50 percent greater than in 1983. However, sewer construction will probably decline in the early 1990s, as a lagged effect of the slower pace of housing starts and commercial construction requiring sewage infrastructure. Another important factor is the decline in inflation-adjusted Federal funding for new sewage treatment plant construction, and conversion of the EPA Construction Grants Program to a loan program.

This category of construction includes solid waste disposal facilities, including resource recovery facilities, which are a small but rapidly growing market. Resource recovery facilities will become increasingly common because of improved efficiency, rising land prices, and environmentalist objections to landfills.

The Clean Water Act of 1987 provides $18 billion for sewage collection and treatment between 1987 and 1994. This Act has checked the decline in the EPA Construction Grants program and resulted in increased obligations. The Act provides for major changes in this program after 1989, with direct grants to communities being replaced with low-interest revolving loans to communities administered by the states for construction of sewage facilities.

After 1991 sewage construction will probably fall even further, because of declining Federal spending and the relatively low level of housing starts. The major uncertainty in the long-range outlook for sewer system construction is the extent to which State and local governments will support the new loan program established by the Clean Water Act. If States augment Federal loan funds with their own funds, construction might increase substantially. On the other hand, the loan program may be much less popular with local governments than the grant-in-aid program was, with the result being less sewage system construction.

Water Supply Systems

Waterworks construction increased sharply during the last half of the 1980s, recovering from its slump early in the decade. Two of the most important factors in this upturn were the recovery in housing starts and the record amounts of municipal bonds issued for water supply systems. Waterworks construction will probably increase slightly in 1991, based on the solid increase in municipal bond sales in 1989 and 1990. Negative factors in this outlook are the declining levels of homebuilding and commercial construction, as well as the tight fiscal condition of some State and local governments.

In the longer term, waterworks will probably be one of the more rapidly growing categories of public construction. The aqueduct systems of most older cities are so ancient that extensive replacement work must be done each year. For the United States as a whole, the current level of construction is much less than that needed to replace the waterworks every 50 years, which is recommended practice. Most water utilities are in a good position to raise the capital needed, so a steady increase in replacement construction is likely for the rest of the century. The Water Resources Authorization Act of 1986 has expanded the role of the Federal Government in municipal water supply, and, although it does not directly provide major funding for water supply, may eventually facilitate major Federal funding for water supply construction.

Educational Buildings

New construction expenditures for schools, libraries, and museums increased by about 14 percent in 1990. About 70 percent of these construction expenditures were for primary and secondary schools, while colleges and other higher education facilities accounted for about a quarter of the total. Nearly 80 percent of educational construction expenditures were for publicly owned buildings and 20 percent were for privately owned buildings.

School construction will probably increase about 5 percent in 1991, although expenditures will probably level off during the early 1990s. The number of births in the U.S. rose between 1976 and 1982, and enrollment in the lower grades has increased, while high school enrollment has been declining. In the early 1990s high school enrollment will increase, thus helping to sustain school construction. Universities are likely to substantially increase their construction spending over the next five years to rebuild deteriorating campuses, according to a survey by the Society for College and University Planning. Additionally, the public is becoming increasingly concerned with the quality of education, with a likely result being increased investment in educational buildings.

Conservation and Development

Conservation and development construction includes water resources development and protection expenditures, as well as the electric power construction programs of the Federal Government. Federal expenditures account for about 80 percent of conservation and development construction, and three Federal agencies—the Army Corps of Engineers, the Bureau of Reclamation, and the Tennessee Valley Authority (TVA)—expend most of the federal funds devoted to this purpose. (State and local government-owned electric power plants are classified under "miscellaneous construction.")

Conservation and development construction was fairly level in 1990, chiefly because declines in Tennesee Valley Authority power program outlays offset small increases in water resources programs. The Water Resources Act of 1986 authorized 181 new water resources construction projects, the first since 1977, which will help to keep water resources construction at high levels well into the 1990s. However, budget pressures will limit funding enough to keep these programs from greatly exceeding current levels.

Military Construction

Military construction includes a wide variety of structures such as housing, airfields, incinerators, warehouses, docks, radar installations, and roads. In recent years, the value of new military construction put in place has been less than 2 percent of the Defense Department's budget outlays. New military construction put in place (see Table 1) differs from the annual military construction appropriation approved by Congress, in that more than two-thirds of that appropriation is spent on overseas work, land acquisition, family housing, and maintenance and repair.

Military construction grew rapidly in the early 1980s, but peaked in 1987, and is likely to decline for the first half of the 1990s. Although military construction spending increased in 1990, this was attributable to quirks in the budget process, and military construction is likely to decline by 10 percent or more in 1991. In 1990 a moratorium was placed on new construction contracts other than those relating to Operation Desert Shield. The five-year budget projections by the Office of Management and Budget indicate that defense investment spending will not increase rapidly enough to keep up with inflation (see Table 6).

Federal Industrial Construction

This category consists of federally owned manufacturing, assembling, and processing buildings and related facilities. More than 60 percent of this construction is funded through the Atomic Energy Defense Activities Program. Most of the construction for this program is related to weapons research and development (R&D) and production, but a large percentage is related to atomic waste isolation and reprocessing. Much of the remainder is for energy R&D facilities.

In 1990 Federal industrial construction increased slightly, and engineering work for a massive new construction project was started. This megaproject is the Superconducting Supercollider (SSC), which is a $8.2 billion atom smasher slated for construction near Dallas, Texas, over a seven-year period beginning in 1990. The SSC has financial and technical problems, and while its future is not yet assured, the Federal budget does contain some funds for it.

The longer-term outlook depends largely on the prospects for the SSC, as well as Federal budget developments. The largest program in this category, Atomic Energy Defense Facilities, is largely dependent upon defense policy decisions.—*Patrick H. MacAuley, Office of Forest Products and Domestic Construction, (202) 377-0132, September 1990.*

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INTERNATIONAL ENGINEERING AND CONSTRUCTION

Design Engineering

The 1989 distribution of U.S. design engineering billings gives some indication of 1991 sales potential. During 1989, 67 U.S. design firms earned $3.2 billion of foreign billings (43.5 percent of worldwide billings), compared to $2.5 billion in 1988. The top 50 U.S. design firms earned the majority ($2.95 billion) of this amount. In 1989 approximately one third of U.S. international design business was in Europe; Asia accounted for nearly 28 percent of the total, while 13.5 percent of U.S. business went to the Middle East.

During 1989, U.S. firms successfuly bid on projects that included project management, design construct, and process engineering skills. These were primarily in industrial, petrochemical, and power facilities that required advanced construction technologies and special expertise. U.S. design and construction firms excelled and were competitive in complex projects requiring high-quality design, construction, and management services.

As the domestic economy contracts, the U.S. engineering community will be under increasing pressure to expand abroad. Higher oil prices as a result of unrest in the Middle East, however, will most likely slow economic growth in Europe as well as the rest of the world.

Prospects for the Middle East itself, a $436.5 million market in 1989, are grim. With 54.4 percent of the market in 1989, U.S. design engineers were major players. Until the region stabilizes, U.S. suppliers will lose these billings and will concentrate their efforts in other geographic areas.

Asia and the Pacific region will remain attractive. Although rising oil prices may slow economic growth, Hong Kong, Korea, Taiwan, Malaysia, Indonesia, and Thailand remain as promising markets for U.S. engineering and design services.

During 1989, U.S. engineering and design billings lagged in other areas. Latin America, still saddled with high debt and slowed economic growth, accounted for only 7 percent of U.S. worldwide billings. Reflecting continued regional economic difficulties, U.S. design engineering billings in Africa were only $161 million.

Table 7: Share of 1989 Foreign Market by Top International Design Firms

(showing region of contract)

Design Firm Nationality	# of Firms	Foreign Billings		Mideast		Asia		Africa		Europe		United States		Canada		Latin America	
		$ Mil	%	$ Mil	%	$ Mil	%	$ Mil	%	$ Mil	%	$ Mil	%	$ Mil	%	$ Mil	%
United States	67	3,228.6	43.5	436.5	54.4	888.8	44.1	161.1	17.2	1,142.4	64.4	0.0		361.2	89.4	233.3	52.6
Canada	11	594.4	8.0	24.8	3.1	149.5	7.4	175.4	18.7	12.6	.7	165.1	16.0	0.0		63.3	14.3
Europe	93	3,118.4	35.0	272.6	33.9	687.8	34.1	547.8	58.4	604.0	34.1	837.0	80.9	40.3	10.0	127.1	28.6
United Kingdom	19	1,182.4	15.9	73.9	9.2	340.0	16.9	107.6	11.5	198.2	11.2	419.5	40.6	28.6	7.1	13.8	3.1
Germany	19	452.3	6.0	66.8	8.3	54.0	2.7	95.7	10.2	45.2	2.5	158.5	15.3	2.1	.5	30.0	6.8
France	10	323.2	4.3	11.8	1.5	30.3	1.5	87.1	9.3	17.5	1.0	169.4	16.4	1.3	.3	5.8	1.3
Italy	11	120.6	1.6	2.5	.3	12.4	0.6	56.5	6.0	18.3	1.0	9.5	0.9	0.0		21.4	4.8
Yugoslavia	2	34.1	.5	27.2	3.4	0.0		3.3	.4	1.1	.06	0.0		0.0		2.4	.5
The Netherlands	11	471.1	6.3	53.1	6.6	135.8	6.7	79.3	8.5	107.0	6.0	60.2	5.8	1.3	.3	34.4	7.8
Other Europe	21	534.8	7.2	37.3	4.6	115.3	5.7	118.1	12.6	216.7	12.2	20.0	1.9	7.0	1.7	19.3	4.3
Japan	14	257.4	3.5	8.8	1.1	211.7	10.5	18.6	2.0	2.2	.1	0.6	0.1	0.0		15.5	3.5
All Other	14	222.7	3.0	60.5	7.5	78.9	3.9	34.6	3.7	12.4	.7	31.6	3.1	2.4	.6	4.6	1.0
All Firms	200	7,421.8	100	803.1	100	2,016.7	100	937.5	100	1,773.7	100	1,034.4	100	403.9	100	443.8	100

SOURCE: *Engineering News-Record,* August 2, 1990 (McGraw-Hill, New York, NY).

International Construction

United States international constructors dominated 1989 international awards, earning fully a third of the $112.6 billion market (see Table 2). No other individual country equalled this performance.

During 1989, U.S. contractors continued to win most of their international construction business in Europe, Asia, and the Middle East. Africa and Asia are emerging as significant markets. European markets remain strong, and developments in Eastern Europe and the USSR indicate good prospects. U.S. companies are positioning themselves to deliver more services in these markets, but it will take considerable increases to make up for the loss of the lucrative and promising market in the Middle East.

Accounting for almost 30 percent of the total $38.3 billion in U.S. awards abroad, Europe was the largest market for U.S. international constructors, with $11.3 billion billed. Asia and the Middle East, with $7.7 and $7.6 billion of awards, respectively, vied for second place.

Elsewhere, U.S. international constructors performed creditably. In Canada, U.S. constructors won 53 percent of the $7.2 billion Canadian international construction market. In Africa, U.S. suppliers won 39 percent of international construction awards. However, although U.S. suppliers led awards, the Latin American market for U.S. contractor services continued to lag.

Despite impressive gains in 1989, U.S. contractors still did not equal 1982 performance. As shown in Table 3, overall, U.S. global awards were down $6.0 billion, or 13.2 percent, from 1982. Middle East performance was still down by 58 percent, followed closely by a 54 percent deficit in Latin America.

Indications are that the Latin American market for U.S. international constructors is strengthening. Latin American countries are making progress in resolving their debt problems, and once this is accomplished, substantial markets for infrastructure renewal and new construction should open. The Pacific Rim also presents active prospects for U.S. international contractors. Already active to the amount of $7.8 billion, up 72 percent from 1988, U.S. contractors may expect substantially more business from the Asian emerging economies. This may require extensive positioning and, possibly, strategic alliances.

New Opportunities

According to *Engineering News-Record,* U.S. design firms increased their billings overseas for the third year in a row as of 1989. Despite stiff competition abroad, U.S. contractors also substantially increased their international billings in 1989 to $38 billion, 34 percent of the world market. A small number of firms continued to dominate the international component of the U.S. engineering and construction industries.

Large changes in the world economic configuration present the U.S. international architectural, engineering, and construction (AEC) industry with new possibilities. U.S. engineers and contractors should be positioning themselves for unprecedented opportunities and challenges in world markets as a result of the United States/Canada Free Trade Agreement, developments in Eastern Europe and the U.S.S.R., Pacific Rim expansion, emerging developing economies, and changes in the European Community.

For example, the European Community (EC) plans a five-year, $120 billion infrastructure program that should be attractive for U.S. engineers. The United Kingdom alone plans to invest over $75 billion in roads, railroads, sewer plants, and the like in the 1990s. The EC transportation ministers have approved a high-speed rail network worth nearly $50 billion to link major cities. A new approach within the centrally planned economies of the Soviet Union and Eastern Europe to private-sector involvement will improve chances for U.S. company participation in economic development in these areas. The conclusion of the Canada/U.S. Free Trade Agreement should stimulate economic growth and new industry opportunities on the North American continent.

The Pacific Rim also presents new opportunities. Japan is embarking on an extensive infrastructure investment program of $2.9 trillion over the next decade and plans to extend $50 billion of foreign aid (much of it untied) to developing countries over the next five years. In addition, countries such as Korea, Taiwan, Thailand, and Malaysia, are beginning to expand their economies.

Table 8: Share of 1989 Construction Export Market by Top International Contractors

(showing region of contract)

Contractor Nationality	# of Firms	Total Awards		Mideast		Asia		Africa		Europe		United States		Canada		Latin America	
		$ Bil	%	$ Bil	%	$ Bil	%	$ Bil	%	$ Bil	%	$ Bil	%	$ Bil	%	$ Bil	%
United States	42	38.3	34.0	7.6	42.7	7.7	31.4	5.6	39.2	11.3	44.5	0.0		3.8	52.8	2.0	26.3
Canada	7	1.0	0.9	0.0		0.1	0.4	0.0		0.1	0.4	0.4	2.6	0.0		0.3	3.9
Europe	115	53.0	47.1	7.6	42.7	8.2	33.5	6.9	48.3	12.6	49.6	10.6	68.4	3.2	44.4	3.9	50.5
France	10	13.3	11.8	0.7	3.9	2.3	9.4	1.9	13.3	2.6	10.2	2.2	14.2	2.6	36.1	1.0	13.2
United Kingdom	13	12.8	11.4	0.4	2.2	3.1	12.7	0.5	3.5	3.7	14.6	4.4	28.4	0.4	5.6	0.3	3.9
Italy	38	10.8	9.6	4.0	22.5	0.9	3.7	1.8	12.6	2.4	9.4	0.5	3.2	0.1	1.4	1.2	15.8
Germany	16	8.6	7.6	0.8	4.5	0.9	3.7	1.7	12.2	1.5	5.9	3.0	19.4	0.0		0.6	7.9
The Netherlands	7	2.9	2.6	0.8	4.5	0.3	1.2	0.4	2.8	1.1	4.3	0.1	0.6	0.0		0.2	2.6
Yugoslavia	8	0.8	0.7	0.4	2.2	0.0		0.0		0.2	0.8	0.0		0.0		0.1	1.8
Other Europe	23	3.8	3.4	0.5	2.8	0.7	2.9	0.5	3.5	1.1	4.3	0.6	3.9	0.0		0.4	5.3
Japan	34	12.6	11.2	1.2	6.7	6.5	26.5	0.4	2.8	0.8	3.1	2.8	18.1	0.2	2.8	0.7	9.7
Turkey	6	0.9	0.8	0.4	2.2	0.0		0.6	4.2	0.0		0.0		0.0		0.0	
All Other	46	6.8	6.0	1.0	5.6	2.0	8.2	0.8	5.6	0.6	2.4	1.7	11.0	0.0		0.7	9.2
All Firms	250	112.6*	100.0	17.8	100.0	24.5	100.0	14.3	100.0	25.4	100.0	15.5	100.0	7.2	100.0	7.6	100.0

NOTE: For engineer-constructors billings only for design and/or related services.
*Columns may not total exactly due to rounding.

SOURCE: Engineering News-Record, July 5, 1990 (McGraw-Hill, New York, NY)

Demographics and World Needs

In addition to current unsatisfied infrastructure needs, demographic trends indicate that world population will continue to expand and age rapidly, requiring an immense amount of new investment. By the year 2025, predictions are that world population will exceed 8.0 billion, compared with 2.5 billion in 1950. According to the World Bank, world population is expected to top 11.0 billion by the end of the next century and the number of persons over 60 will double to 2.4 billion from 1.2 billion in 2025, requiring immensely expanded housing, food, schools, medical facilities, bridges, tunnels, roads, mass transport, and sewerage facilities.

Expanding and aging populations will also place great pressure on world ecosystems, requiring unprecedented levels of ingenuity and technical expertise to meet new needs while preserving the environment. Compounding these problems, mass migrations to urban areas are creating mega cities, with concomitant requirements to prevent urban transport gridlock and air, solid waste, and water pollution. These mega cities will need the planning, infrastructure, and environmental services that the world's engineering and construction industry can provide. As in the past, U.S. engineering and construction companies should be in a position to make an important contribution.

As the industrialized countries' share of the world's population declines, there will be greater pressure on engineers and constructors of developed countries to share technology and establish joint ventures and partnerships with developing country engineers. In order to retain its position as a leader in world engineering and construction services, to maintain current abilities and develop new skills, the United States must educate and provide high-quality postgraduate training to an increasing number of engineers.

U.S. firms must rethink their recruitment and marketing strategies to take advantage of the international markets. In addition to engineering skills, personnel will be expected to have foreign language skills and to exhibit multicultural sensitivity. As older U.S. engineers retire, many U.S. firms will find it necessary to hire more workers who were born and trained abroad. U.S. firms will also need to acquire partners in third-world countries. Foreign subsidiaries, joint ventures (with developed and developing country firms), and acquisitions will become integral parts of marketing strategy.

Financing

In the engineering and construction industry, in addition to quality of performance, financial packaging is extremely important. U.S. companies are often unable to provide financial packages competitive with those offered by foreign companies, which are subsidized by their national governments. Japan's economic assistance to developing countries could thus well be a source of valuable financing to U.S. international engineers and contractors, particularly in the environmental sector.

Table 9: U.S. Construction Companies in Overseas Markets 1982–89

(in billions of dollars except as noted)

Region of Award	# of Firms	1989 ($ Value)	Percent Share	Change 1988–89		Change 1982–89	
				Dollars	Percent	Dollars	Percent
Total	52	39.3	100.0	13.3	50.8	−6.0	−13.2
Europe	22	11.9	30.2	3.1	35.2	5.0	72.1
Asia	27	7.8	19.7	3.2	71.7	−1.1	−12.9
Middle East	19	7.7	19.5	2.1	36.9	−10.7	−58.3
Africa	18	5.7	14.5	4.3	303.7	2.8	96.9
Canada	23	4.2	10.8	1.1	35.0	0.5	14.5
Latin America	40	2.1	5.3	−0.5	−20.8	−2.4	−53.8

NOTE: Data are based on contract awards to 52 companies in 1989; 50 in 1988; 52 in 1987; 54 in 1986; 60 in 1985; 66 in 1984; 68 in 1983; and 77 in 1982.

SOURCE: McGraw-Hill, *Engineering News-Record*, April 19, 1984; April 18, 1985; April 17, 1986; April 16, 1987; April 14, 1988; May 25, 1989; and May 24, 1990.

If Japan further expands its aid program, there would be greater export opportunities for U.S. suppliers through the use of Japanese financing. To better develop a position in the expanding domestic Japanese construction market, U.S. contractors will have to establish branch offices, work with Japanese trading houses, and form partnerships and joint ventures with Japanese design and construction companies.

Japan's development spending is highest in a number of sectors where U.S. design and construction companies are competitive. These sectors include power generation and transmission, pollution control, road and railway construction, telecommunications, process industries, and water resource management.

During 1989, U.S. design and construction firms faced increased foreign competition in their home market. Foreign design firms billed $1.034 billion of design work in the United States, up from $388 million in 1988. The majority of this increased competition came from European design firms, who, led by British, French, German, and Dutch firms, raised their billings in the United States from $110.3 million in 1988 to $837 million in 1989.

Foreign constructors won $15.5 billion of U.S. awards in 1989 (almost 14 percent of the $112.6 billion global international construction market), versus $12.7 billion of construction business in the United States a year earlier. The largest foreign competitors in the U.S. construction market (Table 2) were the United Kingdom, Germany, Japan, and France. Together, contractors from these four countries accounted for four fifths of the value of foreign awards for construction in the United States.

As a group, the Europeans are already formidable competitors for U.S. contractors on world markets. During 1989, they won $53 billion dollars of awards, 47 percent of the world $112.6 billion market. In the Middle East their performance equalled that of U.S. constructors. The establishment of the European Common Market in 1992, a single $4 trillion market of 320 million people without internal borders, will most likely result in strategic intra-European alliances and sharpen the European competitive edge. In Europe and in third markets, consortia of government-backed European design and construction firms may prove to be formidable competition. In order to fulfill opportunities, U.S. constructors need to become familiar with the details of European Community regulations affecting their business, what European competitors are doing, and be prepared to respond to the changing business environment.

Outlook for 1991

The U.S. international design and construction industry depends on the dynamic growth of the world economy. This growth is related to three factors (1) the growth and economic development of regional blocs; (2) the economic development of developing countries, resulting in improved standards of living for billions of people, and (3) the reinforcement of the international financial system through reduction of international debt. Progress in each of these areas should accelerate in 1991, creating the environment for growth in international engineering and construction opportunities. Thus, with the exception of the Middle East, based on 1990 clients, marketing efforts, and successes, 1991 should be a good year for U.S. engineers and contractors, despite sharp competition from foreign suppliers.

Long-Term Prospects

Industry success early in the decade does not ensure that U.S. designers and constructors will maintain their edge in the international marketplace indefinitely. Opportunities clearly exist in the international construction market for firms possessing the ability to effectively promote and market their services. Success for U.S. international design houses and contractors will depend on superior technology and top quality service.

The international design construction market
likely continue to expand well into the next centur
markets remain important to the construction indu
the United States. Provided U.S. firms contin
strong efforts to develop these markets and build
present successes, they may look forward to full p
tion in a dynamically expanding international de
construction market.—*Robert L. Lurensky, Capit*
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6

Wood Products

Current dollar shipments for the wood products industry were down slightly from their 1989 level. Weak demand from principal end-use markets led to generally lower prices; raw material and labor costs continued to climb. One of the few bright spots for the industry was the export market where exports increased for the fifth year in a row.

The wood products industry (SIC 24) is, for the most part, a relatively labor intensive industry dispersed throughout the United States, with primary concentrations in the Pacific Northwest and the South and secondary concentrations in the Midwest, Northeast and Appalachia. Approximately 80 percent of its establishments employ less than 20 employees. Over one-half of these are loggers and logging camps and miscellaneous wood products manufacturers which do not significantly benefit from economies of scale. The preponderance of the industry's output is from large-scale, modern establishments, as evidenced by the fact that the smaller establishments accounted for less than 20 percent of industry shipments in 1987.

Before reading this chapter, please see "How to Get the Most Out of This Book" on page 1. It will clarify questions you may have concerning data collection procedures, factors affecting trade data, forecasting methodology, the use of constant dollars, the difference between industry and product data, sources and references, and the Standard Industrial Classification system (SIC). For other topics related to the subject of this chapter, see chapters 5 (Construction), 7 (Construction Materials), and 10 (Paper and Allied Products).

There are a total of 15 manufacturing sectors within SIC 24 (Lumber and Wood Products), excluding mobile homes and prefabricated wood buildings which are covered elsewhere. Establishments classified in SIC 24 are engaged in the cutting and processing of timber into poles, pilings, lumber, plywood, and more highly processed wood products. According to the Census Bureau, there were 33,982 establishments classified in SIC 24 in 1987; employment totaled close to 633 thousand and shipments were valued at $63.1 billion. The wood products industry ranked 13th among all manufacturing industries in both value of shipments and employment and 14th in terms of new capital expenditures.

Current dollar shipments for selected segments of SIC 24 were $57.9 billion in 1990. Shipments when measured in constant dollars were down approximately 1.5 percent from their 1989 level, and almost 10 percent from 1987. Demand for wood products is closely linked to domestic construction-related activities, such as new housing, remodeling and renovation and commercial construction. Approxiately 80 percent of softwood lumber production and structural panel production goes into construction-related activities. Over the last three years, the value of new construction has declined by almost 10 percent.

The largest share of the industry's construction-related demand comes from the new private residential construction sector. Private housing starts have been on the decline since 1986, falling to 1.22 million units in 1990. Rising home prices along with the maturing of the baby boom generation have been the major causal factors. Rising home prices have contributed to the growth of the repair and remodeling sector of the construction industry and this sector is becoming increasingly important to the wood products industry.

Industry profits were generally lower in 1990. Weak demand led to generally lower prices while raw material and labor costs continued to climb. Stumpage costs were up substantially in many areas of the United States, most notably the Pacific Northwest. Anxiety over future harvest levels in that region, brought on by renewed efforts to have the northern spotted owl named as a threatened specie under the Endangered Species Act, and near-record log exports have caused some stumpage prices to more than double over the past two years. Plywood and lumber mills dependent upon federal and state timber as a source of raw materials have been particularly hard hit and, according to industry sources, this led to the closure of more mills in the first half of 1990 than in any full year since 1982.

It would appear that the industry's concerns regarding the northern spotted owl were well founded since the U.S. Fish and Wildlife Service added the owl to the endangered species list in late June. Forest management-related activities on upward of 8 million acres of forestland could be curtailed and up to 20,000 jobs in the Pacific Northwest could be lost by the listing, according to some industry estimates.

The listing of the northern spotted owl proved to be the catalyst for passage of provisions in the Customs and Trade Act of 1990 (Act) that, beginning in 1991, will restrict the export of most logs harvested from public land in the western United States. The Act, signed by the President on August 20, makes permanent the current temporary prohibition on log exports from federal lands in that region and places a similar restriction on state lands except for the state of Washington which may continue exporting up to 25 percent of its harvest. It is estimated that as a result of the restrictions imposed by the Act, an estimated 500-600 million board feet (2.3 to 2.7 million cubic meters) of logs (mostly softwood logs) will no longer be available for export. This amounts to about 11-13 percent of U.S. softwood log exports.

INTERNATIONAL COMPETITIVENESS

Exports by the wood products industry, aided by a comparatively weak dollar, were up for the fifth year in a row in 1990. This proved to be one of the few bright spots for the industry. Exports for selected segments of SIC 24 were an estimated $6.2 billion in 1990, compared to $5.7 billion in 1989. Japan and Canada continued as the industry's leading overseas markets, accounting for 45 percent and 15 percent of total export sales. Other significant export markets were South Korea, United Kingdom, Mexico, and Germany which together accounted for another 16 percent of export sales. Softwood logs, followed by softwood lumber, were the leading export commodities, accounting for 33 percent and 21 percent, respectively of total exports on a value basis. Other important export commodities included hardwood logs and lumber, wood chips, and softwood plywood.

In recent years, overseas demand for U.S. temperate hardwood, and even to some extent softwood, logs and finished products, has been aided by consumer concern over the rapid deforestation of tropical hardwood forests. Bans on the export of tropical hardwood logs by West Malaysia, Indonesia and Philippines and export taxes on hardwood lumber by Indonesia and Malaysia have also contributed to greater demand for U.S. wood products.

The Government's 1989 investigation of Japanese policies and practices that restrict imports of U.S. forest products into Japan was suspended in mid-June of 1990 shortly after the United States and Japan reached an agreement on wood products trade. The wide-ranging agreement covers building codes, product certification and standards, tariff misclassification, and tariffs. The agreement should expand U.S. access to the Japanese solid wood products market and result in increased U.S. exports of value-added wood products. In addition, to ensure smooth implementation of the agreement and further expand the use of wood for construction in Japan, the agreement also calls for regularly scheduled meetings between the two countries.

U.S. Exports and Imports
Selected Lumber and Wood Products

(in millions of dollars except as noted)

SIC	Industry	1989	1990[1]	1991[2]	Percent Change 1989–90	Percent Change 1990–91
2411	Logging					
	Value of exports	2,455	—	—	—	—
	Value of imports	45.8	—	—	—	—
2421	Sawmills and planing mills, general					
	Value of exports	2,419	—	—	—	—
	Value of imports	3,186	—	—	—	—
2426	Hardwood dimension & flooring mills					
	Value of exports	38.9	—	—	—	—
	Value of imports	45.0	—	—	—	—
2431	Millwork					
	Value of exports	83.7	—	—	—	—
	Value of imports	280	—	—	—	—
2435	Hardwood veneer and plywood					
	Value of exports	181	—	—	—	—
	Value of imports	685	—	—	—	—
2436	Softwood veneer and plywood					
	Value of exports	292	—	—	—	—
	Value of imports	27.6	—	—	—	—
2448	Wood pallets and skids					
	Value of exports	13.1	—	—	—	—
	Value of imports	4.0	—	—	—	—
2491	Wood preserving					
	Value of exports	41.4	—	—	—	—
	Value of imports	22.4	—	—	—	—
2493	Reconstituted wood products					
	Value of exports	168	—	—	—	—
	Value of imports	298	—	—	—	—
	Selected Lumber & Wood Products					
	Value of exports	5,693	—	—	—	—
	Value of imports	4,593	—	—	—	—

See "How to Get the Most Out of This Book" for definitions of the Country Groupings.

SOURCE: U.S. Department of Commerce: Bureau of the Census, International Trade Administration (ITA). Estimates and forecasts by ITA.

U.S. Trade Patterns in 1989
Selected Lumber and Wood Products

SIC 241, 2421, 2426, 2431, 2435, 2436, 2448, 2491, 2493

(in millions of dollars, percent)

Exports	Value	Share	Imports	Value	Share
Canada & Mexico	779	13.7	Canada & Mexico	3,676	80.0
South America	10.4	0.2	South America	183	4.0
European Community	723	12.7	European Community	46.5	1.1
East Asia NICs	737	12.9	East Asia NICs	539	11.7
Japan	2,767	48.6	Japan	6.8	0.1
Other	678	11.9	Other	141	3.1
World Total	5,693	100.0	World Total	4,593	100.0

Top Five Countries

	Value	Share		Value	Share
Japan	2,767	48.6	Canada	3,540	77.1
Canada	576	10.1	Indonesia	319	6.9
South Korea	346	6.1	Taiwan	141	3.1
United Kingdom	209	3.7	Mexico	136	3.0
Mexico	203	3.6	Brazil	124	2.7

[1] Estimate.

[2] Forecast.

SOURCE: U.S. Department of Commerce: Bureau of the Census, International Trade Administration (ITA).

Imports were valued at $4.4 billion in 1990, representing a 3 percent decline from the 1989 level. Canada was our major foreign supplier, accounting for 70 percent of U.S. imports of wood products. Almost half of our imports from Canada were softwood lumber. About 27 percent of softwood lumber consumed in the United States is imported from Canada. This percentage has been on the decline in recent years due, in large part, to the 1986 Memorandum of Understanding between the United States and Canada which resulted in a 15 percent export tax on softwood lumber coming into the United States from Canada. Changes in Canadian forest management practices which pass on more costs to timber purchasers (higher stumpage prices, etc.) have led to the elimination or modification of the export tax in several provinces. The Canadians have informally requested that the negotiations be reopened due to recent changes in the exchange rate between the two countries and a downturn in the Canadian wood products industry.

Other principal suppliers to the U.S. market include Indonesia (hardwood plywood), Taiwan (hardwood plywood and miscellaneous wood products) and Mexico (millwork).

Outlook for 1991

Shipments for selected segments of SIC 24 are projected to decline by about 3.5 percent, measured in constant dollars, in 1991. Most domestic end-use markets are expected to continue to soften. Private housing starts are projected to slip below 1.2 million units in 1991. Continued growth of the remodeling and renovation market and the trend toward larger houses with more amenities is expected to partially offset the expected decline in housing starts.

The biggest issue confronting the industry in 1991 will be continued action by environmentalists and preservationists trying to curtail or modify forest-related activities in the Pacific Northwest and elsewhere. Logs will continue to be in tight supply in the Pacific Northwest; the volume of federal timber offered for sale in that region is projected to drop by 20 percent in 1991. This could lead to more mill closures.

Exports will continue to be one of the industry's few bright spots in 1991. However, exports of some types of softwood lumber could drop substantially if the United States and the European Community are unable to reach an agreement that will delay the implementation of a January 1, 1991 EC ban on the import of green softwood lumber from pinewood nematode infested areas. The pinewood nematode is indigenous to both the United States and Canada. The EC is concerned that the nematode could be "imported" into the EC and damage native forests there.

Long-Term Prospects

The period to 1995 will be somewhat reminiscent of the early 1980s. Rising production costs will lead to a shake-out of the industry, and an increase in consolidations and mergers. Profit levels will change very little over the next five years as price increases will be offset by higher raw material and labor costs. Private housing starts will fluctuate around 1.2 million units for the period. The remodeling and renovation market will become increasingly important in the years ahead.

The wood products industry will continue to expand its market development activities overseas. There will be continued pressure to further restrict log exports if our major trading partners do not take steps to open up their markets to value-added wood products. Exports to Japan should continue to increase.—*C. Michael Hicks, Office of Forest Products and Domestic Construction, (202) 377-0375, October 1990.*

LOGGING OPERATORS

The U.S. logging industry harvested an estimated $10.4 billion worth of sawlogs, veneer logs, pulpwood and related wood products in 1990. Shipments were down 3.8 percent, measured in constant dollars, from their 1989 level due to continued softening of domestic end-use markets. Tight log supplies prevailed in some regions of the country, giving rise to substantially higher stumpage prices. Exports were up approximately 2 percent on a value basis.

Softwood logs accounted for approximately 40 percent of the value of industry's shipments in 1990. Softwood log production was estimated at 44.0 billion board feet (199.3 million cubic meters), down approximately 4.5 percent from the 1989 level on lower lumber production. However, continued tight log supplies in many parts of the country and concern over future availability of supplies led to generally higher stumpage prices for softwood logs.

Stumpage prices for softwood sawtimber in the Pacific Northwest (Douglas-fir, National Forests-West Side) were up substantially, averaging $526 per thousand board feet ($116 per cubic meter) in the first quarter of 1990, compared to $360 ($79) for the same period in 1989. Coupled with a strong (near record) overseas market for softwood logs and the listing of the northern spotted owl as a threatened species under the Endangered Species Act, this precipitated the passage of legislation by Congress that beginning in 1991 will restrict the export of most logs harvested from public lands west of the 100th Meridian which cuts the United States roughly in half from east to west.

Stumpage prices for southern yellow pine sawtimber (Southwide) were also on the upswing in 1990 as the South gradually recovered from the worst southern pine beetle outbreak on record which had caused accelerated harvesting and lower stumpage prices in many areas. Southwide, yellow pine sawtimber averaged $132 per thousand board feet ($29 per cubic meter) in the second quarter of 1990, compared to $118 ($26) for the same period in 1989.

Hardwood log production was estimated at 9.4 billion board feet (44.6 million cubic meters) in 1990, down approximately 5 percent from the 1989 level. This decline can be attributed to sluggish foreign and domestic demand by hardwood lumber and veneer users, most notably furniture producers. However, stumpage prices which tend to lag production continued to climb, averaging $118 and $76 per thousand board feet ($26 and $17 per cubic meter) for oak and mixed hardwoods, respectively, for the second quarter of 1990, compared to $102 ($23) and $71 ($16) for the same period in 1989.

After four consecutive years of record sales, domestic producers of market pulp (SIC 2611) experienced a slight

Trends and Forecasts: Logging (SIC 2411)

(in millions of dollars except as noted)

Item	1987	1988[1]	1989[2]	1990[2]	1991[3]	Percent Change 1987-88	1988-89	1989-90	1990-91
Industry Data									
Value of shipments[4]	10,880	11,747	13,170	13,405	—	8.0	12.1	1.8	—
Value of shipments (1987$)	10,880	10,441	10,760	10,351	10,072	−4.0	3.1	−3.8	−2.7
Total employment (000)	85.7	87.2	92.2	86.5	—	1.8	5.7	−6.2	—
Production workers (000)	72.1	73.1	76.4	73.4	—	1.4	4.5	−3.9	—
Average hourly earnings ($)	9.14	9.05	9.12	9.04	—	−1.0	0.8	−0.9	—
Capital expenditures	349	222	—	—	—	−36.4	—	—	—
Product Data									
Value of shipments[5]	10,553	11,232	12,775	13,002	—	6.4	13.7	1.8	—
Value of shipments (1987$)	10,553	9,982	10,437	10,040	9,769	−5.4	4.6	−3.8	−2.7

[1] Advance data from the 1988 Annual Survey of Manufactures.

[2] Estimate.

[3] Forecast.

[4] Value of all products and services sold by establishments in the logging industry.

[5] Value of products classified in the logging industry produced by all industries.

SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA). Estimates and forecasts by ITA.

decline in shipments in 1990. Nevertheless, pulpwood (roundwood and chip) production increased to 99.3 million cords (253.2 million cubic meters)in 1990, driven by near record chip exports. Hardwood pulpwood's share of the market continued to increase, accounting for approximately 40 percent of total pulpwood production. Hardwood pulpwood is utilized in the manufacture of uncoated groundwood paper used in newspaper, magazine or other even-grained smooth paper. The demand for hardwood pulpwood has been growing worldwide. Prices for both softwood and hardwood pulpwood were up substantially in 1990. Southern yellow pine pulpwood prices (Southwide) averaged $16.32 per cord ($6.40 per cubic meter) for the second quarter of 1990, compared to $14.11 per cord ($5.53 per cubic meter) for the same period in 1989. Hardwood pulpwood prices (Southwide) averaged $6.95 per cord ($2.73 per cubic meter) for the second quarter of 1990, compared to $5.90 per cord ($2.31 per cubic meter) for the same period in 1989.

The United States exported an estimated 4.0 billion board feet (18.1 million cubic meters) of sawlogs, veneer logs and related wood products in 1990, valued at $2.5 billion. Softwood log exports, valued at $2.3 billion, accounted for approximately 90 percent of total log exports on a value basis. Softwood log exports in 1990 were up approximately 3 percent on a value basis and down approximately 7 percent on a volume basis. A saturated market in Japan, coupled with substantially higher softwood log prices, led to the drop in volume.

Douglas-fir was the leading export specie, accounting for 50 percent of total softwood log exports on a volume basis. Western hemlock and spruce were the second and third leading export species, comprising 32 percent and 11 percent, respectively, of total softwood log exports. Japan continued to be the top U.S. export market for softwood logs, accour ing for an estimated 70 percent of total softwood log expor on a volume basis. The other significant export market w South Korea, accounting for 15 percent of total softwood lo exports.

FDM Magazine

Exports for U.S. wood products have increased for the fifth year in a row.

Hardwood log exports were an estimated 169 millic board feet (801,000 cubic meters) in 1990, down 19 percer from their 1989 level. However, growing concern ov defoliation of tropical hardwood forests and bans on tl export of tropical hardwood log exports by some supplie countries (Indonesia, Philippines, and peninsular Mala sia) caused the value of hardwood log exports to increase b almost 6 percent. Canada was the industry's leading hard wood log export market, accounting for approximately 2 percent of total exports on a volume basis. Hardwood lo exports to Canada doubled in 1990. Many of these log were manufactured into higher value-added products fo the Canadian market or for export overseas. Other leadin export markets for hardwood logs were Japan, West Ger many, Italy, South Korea, and Taiwan, accounting for 2 percent, 15 percent, 8 percent, 8 percent, and 7 percent respectively, of the total volume of exports. White and re oak logs were the two leading export species, accountin for 19 percent and 18 percent, respectively, of total export on a volume basis.

Imports of logs and related wood products, mostly fron Canada, were valued at approximately $43 million in 1990 down 9 percent from the 1989 level. Western lumber produc ers, looking for a way to bolster rapidly shrinking timbe supplies, imported several small shipments of Soviet logs t determine whether lumber manufactured from these logs ca be substituted for lumber produced from domestic species.

Outlook for 1991

Constant-dollar shipments by the logging industry ar projected to decline by 3 percent in 1991. Domestic end-us markets are expected to continue to soften; private housin starts are projected to decline to about 1.15 million units i 1991, compared to 1.22 million units in 1990. The volum of federal timber offered for sale in the Pacific Northwes (Oregon, Washington, and northern California) will dro by about 20 percent due to the listing of the norther spotted owl as a threatened species. Exports are expected t remain at or near their present level.

Long-Term Prospects

Log shipments could decline another 5 percent by the en of the period. However, much will depend upon what happens in the Pacific Northwest. According to industry sources harvest levels (federal timber) in the region could drop by a much as 50 percent unless some means is found to balance th conservation of the northern spotted owl and the economi well-being of families who are dependent upon the forests fo their livelihood. Domestic end use markets should stabilize private housing starts are expected to average around 1. million units for the period. Exports, at least over the nea term, will remain at or near their present level. Indications ar that the private sector will be able to make up most of th volume that the new legislation restricts from export. However, exports could drop substantially near the end of th period.—*C. Michael Hicks, Office of Forest Products an Domestic Construction, (202) 377-0375, October 1990.*

LUMBER

The sawmills and planing mills industry (SIC 2421) produces lumber, wood chips, softwood flooring and furniture stock, and other general sawmill products, including railway ties and fence lath. In 1990, softwood lumber accounted for about 58 percent of this industry's total value of shipments, while hardwood lumber made up about 12 percent and woodchips approximately 10 percent, with the remaining 20 percent accounted for by other general sawmill products.

In 1989 lumber production was 48.5 billion board feet (114.5 million cubic meters); 37.5 billion board feet (88.5 million cubic meters) in softwood lumber and 11 billion board feet (26 million cubic meters) in hardwood lumber. Total lumber production declined almost 1 percent in 1990 to about 48 billion board feet (113 million cubic meters). Softwood lumber has historically made up approximately 78 percent of total production.

The South accounts for over 35 percent of U.S softwood lumber production (Southern yellow pine), the West accounts for approximately 31 percent of production (spruce, Douglas-fir, hemlock, and redwood) while the inland area (Rocky Mountain states) produces about 30 percent in mostly lodgepole pine and fir. Hardwood lumber mostly comes from the Appalachian region, including the states of Kentucky, Virginia, West Virginia, Maryland, and North Carolina; the southern states of Louisiana, Arkansas, Mississippi, and Tennessee; and the northern states of Wisconsin, Michigan, Illinois and Minnesota. Major hardwood species produced are oak, maple, poplar, ash, and basswood.

The constant dollar value of the sawmills and planning industry shipments, based on 1987 dollars, rose about 2.4 percent in 1988 (from $17,357 million to $17,767 million), was relatively flat in 1989, and is expected to decrease approximately 2.5 percent in 1990.

The principal end-use market for softwood lumber is single family housing, which dropped by more than 7 percent in 1989, and thus contributed to the decline in softwood lumber production. Although there was a 4 percent decline in 1989 production of hardwood lumber, there was just over a 1 percent increase in shipments. This was due to a more than adequate inventory and a strong home improvement industry. Primary markets for hardwood lumber are pallets and skids, furniture, flooring, and decorative moldings.

Residential construction has been relatively strong over the past decade. However, since 1987 it has been experiencing a steady decline. In 1986 new housing starts were 1.8 million, they declined to 1.6 million in 1987, to 1.5 million in 1988, and to 1.4 million units in 1989. This trend continued through 1990 when starts were just over 1.2 million. In 1991 starts are projected to slip below 1.2 million.

Residential repair and remodeling is a major factor in the demand for lumber, and this market is expected to grow at a 3 to 4 percent rate through 1990, and into 1991. In many cases families are choosing to upgrade current homes rather than investing in new ones. Home improvements currently account for approximately 33 percent of the overall domestic demand for lumber. Both softwood and hardwood lumber benefit from this industry. Softwood lumber is used in decks and additions, while hardwood lumber is used in flooring, cabinetry, and decorative molding.

Employment in the sawmill and planing industry decreased approximately one percent in 1989 to about 150 thousand. This number is expected to decline another 2 percent in 1990, in large part due to the lower demand for lumber and temporary shortages of raw materials resulting in mill closures.

The spotted owl was listed as threatened under the Endangered Species Act in late June of 1990. Logging restrictions implemented as a result of this listing could affect approximately 8.4 million acres of federal, state, and private timberland in the states of California, Oregon, and Washington. However, 40 percent of this acreage has already been set aside legislatively as wilderness and parks.

The anticipated short supply of logs as a result of the spotted owl controversy in the Pacific Northwest during 1990 was not as severe as expected due to several factors. The Hatfield-Adams amendment to the 1990 Interior Appropriations bill mandated the Bureau of Land Management and the Forest Service sell enough timber to partially offset any shortages. Also, the ability of small private timber owners to fill in the gap of lost federal timber, the 2 to 3 year timber volume under contract to which many mills had access, and a slump in demand helped alleviate major log shortages in 1990. Most northwest mills were able to function with only temporary shutdowns and curtailments.

Log shortages are expected to increase significantly over the next few years, starting in 1991, as contracts are

Trends and Forecasts: Sawmills and Planing Mills, General (SIC 2421)

(in millions of dollars except as noted)

Item	1987	1988[1]	1989[2]	1990[2]	1991[3]	Percent Change 1987–88	1988–89	1989–90	1990–91
Industry Data									
Value of shipments[4]	17,357	18,318	19,115	18,792	—	5.5	4.4	−1.7	—
Value of shipments (1987$)	17,357	17,767	17,748	17,304	16,439	2.4	−0.1	−2.5	−5.0
Total employment (000)	148	152	151	148	—	2.7	−0.7	−2.0	—
Production workers (000)	129	132	132	129	—	2.3	0.0	−2.3	—
Average hourly earnings ($)	8.45	8.75	9.06	9.36	—	3.6	3.5	3.3	—
Capital expenditures	512	532	—	—	—	3.9	—	—	—
Product Data									
Value of shipments[5]	16,941	18,227	18,732	18,510	—	7.6	2.8	−1.2	—
Value of shipments (1987$)	16,941	17,678	17,393	17,044	16,275	4.4	−1.6	−2.0	−4.5

[1] Advance data from the 1988 Annual Survey of Manufactures.

[2] Estimate.

[3] Forecast.

[4] Value of all products and services sold by establishments in the sawmills and planing mills, general industry.

[5] Value of products classified in the sawmills and planing mills, general industry produced by all industries.

SOURCE: U.S. Department of Commerce: Bureau of the Census, International Trade Administration (ITA). Estimates and forecasts by ITA.

fulfilled and spotted owl habitat is more accurately defined. It is estimated that as many as 9 percent of the 638 sawmills in the northwest could shutdown on a longterm basis by 1992 due to log shortages and a sluggish market.

Lumber prices, which increased slightly in 1989, are expected to decrease by about 5 percent in 1990. The softwood lumber composite price at the end of the third quarter of 1989 was $260 per thousand board feet (mbf); by the end of the 1990 third quarter it had dropped to $247 per mbf. Composite hardwood lumber prices were also down in 1990 by about 2 percent.

INTERNATIONAL COMPETITIVENESS

The value of exports for this industry was up by about 8 percent in 1990 over 1989 while the quantity of exports dropped by approximately the same percentage. The increase in value is not as substantial as experienced in 1987 and 1988, but those were unusual years with 37 percent and 16 percent increases, respectively.

The value of softwood lumber exports for 1989, almost $1.4 billion, is expected to increase by about 6 percent in 1990, although quantity will decrease by almost 8.8 percent, from 3.4 billion board feet to 3.1 billion board feet (8.0 to 7.3 million cubic meters). The value of hardwood lumber exports for 1989 was a little over $152 million and is expected to increase by 25 percent in 1990, but with a decrease of almost 6 percent in quantity, from approximately 850 million to 800 million board feet (2.0 to 1.9 million cubic meters). The 1990 value of sawmill-produced wood chip exports should be up about 10 percent over the 1989 value of $349 million with a decrease in quantity of about 1 percent from the 3.6 million metric tons exported in 1989. Certain general sawmill products are experiencing significant increases in export values, such as railway ties, which increased in 1990 by approximately 500 percent, with Canada as the major purchaser. Exports of general sawmill products, including railway ties, fence lath, sawdust, and resawed lumber depend mostly on individual country needs. In most cases these needs prove temporary, without long-term obligations. Rising prices for raw materials is the major cause for the increase in values over quantities.

Japan and Canada continue to be the major importers of U.S. produced lumber and sawmill products. In 1989, Japan imported 40 percent of the value of U.S. exported softwood lumber and 21 percent of the hardwood lumber. Canada imported 12 percent and 21 percent, respectively. Lumber exports to Canada in 1990 show significant increases while Japanese imports of U.S. lumber have remained flat.

The major species of softwood lumber exported in 1989 were Douglas-fir, of which Japan imported 31 percent and Australia 18 percent; hemlock, of which Japan imported 92 percent; and southern yellow pine, of which Spain imported 24 percent and Iraq imported 15 percent. Other significant importers of softwood lumber include Italy and Mexico. Major hardwood export species were red oak, of which Canada imported 29 percent and Taiwan imported 18 percent; white oak, of which the United Kingdom and West Germany imported 16 and 15 percent, respectively. Belgium also imported significant amounts of hardwood.

Japan is the major importer of U.S. woodchips, accounting for almost 90 percent of U.S. exports. In 1989 the U.S. exported about 3.6 million metric tons of sawmill produced chips; 2 million metric tons were coniferous and 1.6 million metric tons were nonconiferous. Japan imported 95 percent of the softwood chips and 82 percent of the U.S. hardwood chips exported. Taiwan imported 8 percent and Mexico and South Korea both imported about 5 percent of the U.S. hardwood chips exported in 1989.

Approximately 95 percent of U.S. imports for this industry come from Canada. Softwood lumber accounts for approximately 85 percent of all imports. Softwood lumber imports declined in 1990 by almost 10 percent from the 1989 value of $2.84 billion due to a drop in domestic housing starts and the U.S. industry's ability to better compete with Canadian lumber producers.

In 1990 Canadian softwood lumber accounted for about 27 percent of domestic consumption. This percentage has gradually dropped since 1985, when Canadian softwood lumber was 33 percent of domestic consumption. This drop is in large part due to the 1986 Memorandum of Understanding (MOU) between Canada and the United States which resulted in a 15 percent export tax on softwood lumber coming from Canada. In British Columbia, the main supplier of softwood lumber to the United States, the export tax has been eliminated because of higher stumpage prices and new forest management practices which pass through most of the reforestation costs to purchasers. The Province of Alberta continues with the 15 percent export tax, and Quebec is paying a reduced tax of 8 percent. The Maritime Provinces have been exempted from the MOU. The MOU is open-ended and the Government of Canada has informally called for new negotiations. No such talks have been scheduled.

The domestic industry continues to pursue new markets within the Pacific Rim, the Peoples Republic of China, and Europe. Housing shortages in some of these areas, coupled with log export restrictions in Malaysia, Indonesia, and the United States, along with export taxes recently implemented on hardwood lumber in Indonesia and Malaysia, could lead to new or increased markets for U.S. lumber producers.

Outlook for 1991

Total lumber production is expected to decline again in 1991 by about 5 percent. Wood chip production should remain strong due to the growing fiber demand from pulp and paper industries, both domestic and in Southeast Asia.

The decline in the sawmills and planing mills industry is directly related to the construction industry, particularly the residential housing sector. The number of single-family and multi-family units will decline by about 5 and 8 percent respectively in 1991, according to projections. However, growth in the repair and remodeling industry as well as in export markets will help offset some of the impact of this slump in new housing starts.

Exports of softwood lumber from the Pacific Northwest to the European Community (EC) could drop substantially in 1991 due to the scheduled EC ban on imports of green softwood lumber from pinewood nematode infested areas. The United Kingdom is expected to grant the U.S. a one year extension from the ban, as was done with Canada. This will lessen the impact and give the Pacific Northwest time to install the kiln-drying facilities necessary to meet the criteria of the phyto-sanitary standard.

Long-Term Prospects

The U.S. sawmills and planing industry is faced with some serious problems over the next few years. Tight log supplies, decreasing housing starts, and a sluggish economy will contribute to a slowing down in this industry over the next five years, as will continued environmental pressures.

Between 1985 and 1990 the industry grew at an average annual rate of about 4 percent. Over the next five years, 1991 through 1995, it is expected to grow at an average annual rate of 1 percent.

Concessions gained as part of the recent U.S.-Japan Wood Products Agreement should help export sales to Japan. The Uruguay Round of the General Agreement on Tariffs and Trade (GATT) could, depending upon its outcome, also contribute to increased exports of many of this industry's products.—*Barbara Wise, Office of Forest Products and Domestic Construction, (202) 377-0375, October 1990.*

HARDWOOD DIMENSION AND FLOORING

The hardwood dimension and flooring industry (SIC 2426) produces lumber used in furniture, flooring, and specialty items such as skis, golf clubs and tool handles. Furniture parts accounts for about 44 percent of the industry's volume of output, while hardwood flooring claims about 36 percent, and miscellaneous items make up the remaining 20 percent.

Constant-dollar value (1987 dollars) of shipments by this industry fell more than four percent in 1990. For most consumers, furniture is a long-term financial commitment and, due to the uncertain economy during much of 1990, many consumers delayed such purchases, thus contributing to the downturn in industry shipments.

The industry produces four major types of flooring: strip, parquet, plank, and laminated. Strip flooring consumes the most wood per area covered. In 1989, strip and plank flooring accounted for an estimated 65 percent of the lumber used in flooring, while parquet panels and specialty flooring accounted for the remainder.

Commercially available hardwood forests are mostly located in the eastern third of the United States. Oak and maple are the most common hardwood species used in the production of furniture and flooring. Other popular species include ash, birch, cherry, poplar, and walnut. Almost 300 species of nonconiferous (hardwood) trees grow in the United States, including almost 100 tropical species found mostly in Florida. The tropical species are generally not available for lumber production because of state and federal restrictions on logging in environmentally sensitive areas.

Apparent domestic consumption of hardwood dimension used in furniture and flooring increased by more than 6 percent in 1989 over 1988, but decreased by about 7 percent in 1990 when compared to 1989. This decrease was due in large part to a downturn in housing starts. Although the home repair and remodeling business, a major market for this industry, grew by 4 percent in 1990, it was not enough to offset the decrease in demand brought by the 11 percent decline in housing starts.

Exports of hardwood dimension and flooring traditionally make up between 8 and 10 percent of the total value of hardwood lumber exports. Exports of hardwood lumber increased by about 30 percent in 1990 on a value basis, while the volume decreased by almost 10 percent. Higher prices and increased foreign demand for higher valued hardwood dimension lumber accounted for this. Bans on the export of logs and export taxes on hardwood lumber implemented by Malaysia and Indonesia, have increased demand for U.S. hardwood lumber.

The major importers of U.S. hardwood flooring and dimension are Canada, Japan and Taiwan. Canada, Taiwan, and Yugoslavia are the major suppliers of these products to the U.S., and over the past several years they have supplied about 12 percent of domestic consumption.

Almost half of those employed in this industry are located in North Carolina, Tennessee, Mississippi, and Arkansas. In 1987 this industry employed 29,900 people, almost a 10 percent increase over 1986. During 1988 and 1989 employment fell to about 29,000, and employment is expected to decrease again in 1990 to approximately 28,300.

Outlook for 1991

New order levels and declining housing starts indicate that this industry will experience about a 5 percent decline in 1991. The furniture industry is experiencing a slowdown in new orders which began in mid 1990 and is expected to continue through 1991. This will have a negative impact on these hardwood-dimension manufacturers who ship heavily to furniture manufactures. Demand for U.S. exports will increase, however, providing some cushion for decreasing domestic demand. Long-term contracts with foreign mar-

Trends and Forecasts: Hardwood Dimension and Flooring Mills (SIC 2426)

(in millions of dollars except as noted)

Item	1987	1988[1]	1989[2]	1990[2]	1991[3]	Percent Change 1987-88	1988-89	1989-90	1990-91
Industry Data									
Value of shipments[4]	1,714	1,730	1,794	1,739	—	0.9	3.7	−3.1	—
Value of shipments (1987$)	1,714	1,644	1,670	1,597	1,517	−4.1	1.6	−4.4	−5.0
Total employment (000)	29.9	28.9	29.1	28.3	—	−3.3	0.7	−2.7	—
Production workers (000)	26.2	25.2	25.3	24.6	—	−3.8	0.4	−2.8	—
Average hourly earnings ($)	6.49	6.90	7.28	7.53	—	6.3	5.5	3.4	—
Capital expenditures	66.3	49.8	—	—	—	−24.9	—	—	—
Product Data									
Value of shipments[5]	1,651	1,644	1,699	1,658	—	−0.4	3.3	−2.4	—
Value of shipments (1987$)	1,651	1,583	1,598	1,527	1,454	−4.1	0.9	−4.4	−4.8

[1] Advance data from the 1988 Annual Survey of Manufactures.

[2] Estimate.

[3] Forecast.

[4] Value of all products and services sold by establishments in the hardwood dimension & flooring mills industry.

[5] Value of products classified in the hardwood dimension & flooring mills industry produced by all industries.

SOURCE: U.S. Department of Commerce: Bureau of the Census, International Trade Administration (ITA). Estimates and forecasts by ITA.

kets will be more costly due to economic uncertainties. However, sufficient raw material availability and recent technology advances give the U.S. industry stronger position internationally.

Long-Term Prospects

Public pressures, both foreign and domestic, are expected to have an impact on the hardwood industry in the future. Consumers in the United Kingdom have initiated a boycott on the use of tropical timber that is not certified as coming from "sustainable troprical resources." Similar boycotts are being discussed in the United States and elsewhere in Europe. Just how this might affect world markets is not yet clear, but certainly prices will increase due to supply interruptions and increased government regulation of trade.

Many people in this industry feel the 90s will be "the decade of the animals and plants" which may lead to tougher regulations on logging and land management, and stricter air pollution laws. These changes are bound to increase costs and the question will be whether the consumer is willing to pay higher prices for these lumber commodities.

Over the next five years the hardwood dimension and flooring industry is expected to grow by about 1.7 percent annually, while residential housing starts are expected to remain stagnant. The home improvement business should experience an annual 2 percent growth. Availability of hardwood timber is currently adequate to produce the needed lumber for this industry.—*Barbara Wise, Office of Forest Products and Domestic Construction, (202) 377-0375, October 1990*

MILLWORK

Millwork industry (SIC 2431) shipments totaled $9.5 billion in 1990, down 1 percent (1987 dollars) from the previous year. After undergoing rapid growth since 1982, the U.S. millwork industry suffered through its third consecutive year of a slowdown.

The stagnant domestic market facing most millwork producers stems from two main factors: the decline in U.S. housing starts from 1.8 million units in 1986 to 1.22 million in 1990 and the drop in the growth of the repair/remodeling expenditures during 1988 and 1989. Despite the erosion in the millwork industry's primary markets in 1990, constant dollar shipments remained over 90 percent above what they were in 1982. U.S. millwork producers are particularly susceptible to developments in housing and repair/remodeling since they look to these two sectors for most of their sales. Since 1986, when the level of new construction began to decline, the repair/remodeling market has become an increasingly important component of total U.S. millwork demand.

The largest industry commodity grouping was wooden doors, which accounted for an estimated 30 percent of industry shipments (value basis). Wooden windows (including vinyl and aluminum-clad windows) comprised 26 percent, while wood moldings accounted for 14 percent of shipments. The remaining millwork industry shipments included wooden stairs and components, wood blinds and shutters, and exterior millwork, including porch columns, porch rails, newels, and other related products.

Of the total U.S. door shipment level of about 38 million units, 26 million went into new construction while the remaining 12 million were used in repair/remodeling. In 1988, 32 percent of all doors went into repair/remodeling applications, up from 26 percent in 1984. U.S. window shipments totaled 56.2 million units in 1988, of which 74 percent were used in residential construction while the remaining 26 percent went into non-residential construction and repair/remodeling. Since 1986, growing demand from repair/remodeling markets has been the major driving force behind the sustained growth in U.S. wood window shipments. Approximately 60 percent of all wood molding shipments go into repair/remodeling while the remaining 40 percent are used in new construction.

Door materials have been changing since the 1970s, and millwork producers have been adjusting their product lines accordingly. Solid wood doors account for proportionally fewer doors, mostly because of the cited lower costs, greater energy efficiency and lower maintenance requirements of products made from alternative materials. Steel doors are now the most commonly used exterior door in new construction, accounting for about 63 percent, up from 43 percent in 1984. Manufacturers of exterior steel doors also have captured about 43 percent of the repair/remodeling market. Steel doors have become very popular throughout every region of the country, with the exception of the West, where wooden doors are more common. In the interior door market, molded hardboard doors that resemble traditional panel doors have become very popular in recent years. Between 1984 and 1988, their share of the

Trends and Forecasts: Millwork (SIC 2431)

(in millions of dollars except as noted)

						Percent Change			
Item	1987	1988[1]	1989[2]	1990[2]	1991[3]	1987–88	1988–89	1989–90	1990–9
Industry Data									
Value of shipments[4]	9,326	9,263	9,490	9,375	—	−0.7	2.5	−1.2	—
Value of shipments (1987$)	9,326	8,991	8,812	8,633	8,460	−3.6	−2.0	−2.0	−2.0
Total employment (000)	89.0	91.5	89.7	88.8	—	2.8	−2.0	−1.0	—
Production workers (000)	71.6	71.9	70.1	69.4	—	0.4	−2.5	−1.0	—
Average hourly earnings ($)	9.27	9.88	9.95	10.02	—	6.6	0.7	0.7	—
Capital expenditures	184	156	—	—	—	−15.2	—	—	—
Product Data									
Value of shipments[5]	8,789	8,816	9,031	9,015	—	0.3	2.4	−0.2	—
Value of shipments (1987$)	8,789	8,557	8,385	8,301	8,051	−2.6	−2.0	−1.0	−3.0

[1] Advance data from the 1988 Annual Survey of Manufactures.

[2] Estimate.

[3] Forecast.

[4] Value of all products and services sold by establishments in the millwork industry.

[5] Value of products classified in the millwork industry produced by all industries.

SOURCE: U.S. Department of Commerce: Bureau of the Census, International Trade Administration (ITA). Estimates and forecasts by ITA.

interior door market in new construction went up from 19 to 35 percent. Another type of door making large market inroads is a compression-molded fiberglass face pressed over a foam plastic core, which can be easily worked and stained to provide a "natural wood" appearance.

Since the early 1980s there have also been substantial changes in U.S. window markets. Wooden window manufacturers have begun to regain many of their markets lost to metal window manufacturers during the 1970s. However, most of the recent increase in demand has been for vinyl or aluminum-clad wooden windows, which combine the natural strength of wood in the unit's framing with the insulating and low maintenance benefits of vinyl and aluminum. Wood-framed windows currently account for 45 percent of all windows used in new construction and 34 percent of those going into repair/remodeling applications. Another major development in window materials has been the rapid growth in solid vinyl windows. Vinyl window manufacturers, who had just 1 percent of the window market in 1981 increased their share to 18 percent by 1988. Most of the growth in vinyl window shipments has been in the repair/remodeling market, where they account for 31 percent of all windows sold; their market share in new construction is still just 1 percent. Until quite recently, vinyl window producers had been focusing most of their marketing efforts toward contractors and do-it-yourself centers serving the repair/remodeling markets. Now, they are beginning to target new home builders.

Millwork industry employment totaled an estimated 88,800 in 1990, down 1 percent from 1989 while the number of industry establishments totaled 2,770. Traditionally, the U.S. millwork industry has consisted mostly of smaller producers; in 1989, an estimated 72 percent of the millwork establishments employed fewer than 20 people while less than 5 percent employed more than 100 people. This proportion of large and small establishments is basically unchanged from 1972. The millwork industry is characterized by its easy market entry and exit. Most millwork operations primarily serve local markets, although some of the larger establishments also ship nationwide as well as overseas.

INTERNATIONAL COMPETITIVENESS

U.S. millwork exports increased 35 percent in 1990 over 1989 to $113 million. The export mix was comprised of wood moldings (51 percent), wooden doors (30 percent), wooden windows (17 percent),and wood blinds and shutters (2 percent). Wood molding exports went primarily to Canada, which accounted for about 95 percent of the total, followed by Japan and Mexico which were important secondary markets. Canada was the leading foreign market for U.S. wooden door producers, accounting for an estimated 28 percent of the total, followed by the United Kingdom (19 percent), Japan (16 percent), and Mexico (10 (percent). The largest foreign market for U.S. wood window manufacturers was Canada, which accounted for 56 percent of total exports, while Japan was second with 20 percent, followed by Taiwan, which purchased an estimated 9 percent.

Mexico was the leading molding supplier, accounting for about 50 percent of total molding imports and 70 percent of U.S. imports of softwood moldings. Non-standard wood moldings comprised over 50 percent of the molding import mix. This type of moldings, which frequently require a greater amount of labor in their manufacture, have become increasingly common in the import trade since 1982, when they accounted for 33 percent of U.S. molding imports.

FDM Magazine

U.S. exports of millwork are expected to increase an additional 15 percent over the next few years.

U.S. wooden door imports accounted for an estimated 24 percent of total millwork imports. Canada and Mexico were the leading suppliers, each accounting for an estimated 17 percent of the total, followed by Taiwan (14 percent) and Brazil (12 percent). About 85 percent of the imported doors are panel doors while the remainder are flush doors. U.S. window imports (about 7 percent of the millwork total) were mostly from Canada (34 percent), Denmark (25 percent) and Mexico (18 percent). Wood blinds and shutters were primarily imported from Mexico, Taiwan and China, which shipped 28, 26 and 22 percent, respectively.

Outlook for 1991

The U.S. millwork industry is expected to register a 2 percent decline in shipments (1987 dollars) in 1991. This forecast is made with the expectation of continued weak U.S. residential and non-residential construction markets. Repair/remodeling, the industry's other leading market, is also expected to show slower real growth in 1991. The recent trend toward larger houses with more amenities (including more millwork) is expected to continue, however. This should partially offset the lackluster performance of major markets.

U.S. exports of millwork are projected to continue their trend of strong growth registered in the last few years, increasing an additional 15 percent. A continued weak U.S. dollar and modest economic growth overseas is assumed in this forecast. Canada will remain the industry's leading overseas market. As noted earlier, Japan also shows great promise as a growth market, and more millwork exporters are expected to look to that market for additional sales. Imports are expected to drop by 5 percent. Most of the registered millwork imports will continue to be wood moldings, mostly from Mexico.

Long-Term Outlook

The U.S. millwork industry is expected to grow by 1 to 2 percent annually over next 5 years. This industry will remain highly dependent on the domestic level of new construction and repair/remodeling activities, and accordingly this forecast assumes a modest upturn in new construction and repair/remodeling. Homebuilders are also expected to continue constructing larger, more luxurious houses, which typically will demand more millwork per unit. The millwork industry's repair/remodeling market is expected to show steady long-term growth because of the increasing size and age of the nation's housing stock and because, as new house prices rise, many homeowners will choose to improve their existing residence.

U.S. wood window shipments are expected to increase, although producers will continue facing strong competition from vinyl window manufacturers. While most of the competition will still be in the repair/remodeling sector, vinyl window producers will focus more on the new construction market. Wood window manufacturers also will experience increased market demand for their products in new construction, since most new residences are typically being built with more costly and ornate windows.

U.S. wood door manufacturers will face continued competition, especially in the middle class housing and repair/remodeling markets, from steel and compression-molded fiberglass door producers. Solid wood doors will increasingly be used, however, in upscale new homes and repair/remodeling applications. On balance, wood door shipments will show slow but steady growth over the next 5 years.

Domestic shipments of wood moldings are forecast to grow very slowly during the next 5 years because of the already mentioned developments in the industry's leading markets and rising imports. Over the next 5 years, total U.S. demand for wood moldings is expected to grow modestly. However, increased molding imports, especially from Mexico and the Pacific Rim region, will capture most of the increase in domestic demand. U.S. imports of wo moldings from Mexico's U.S. border region are expected further increase as some U.S. producers expand th facilities there because of lower production costs. Indor sian and Malaysian molding exports to the United Sta are projected to increase substantially during the nex years, as those countries move further toward restricti overseas shipments of minimally-processed items, wh encouraging the export of value-added commodities.

Millwork exports are forecast to continue growing over next few years as U.S. exporters become increasingly soph ticated in overseas markets and because of U.S. lumber a plywood industries' overseas marketing activities promot wood housing that will also benefit U.S. millwork produce Again, this forecast assumes continued economic growth most U.S. trading partners and a weak U.S. dollar. Althou Canada will remain the leading export market, U.S. millwo exporters will increasingly be looking to the Pacific Rim additional sales. Growing repair/remodeling markets in pan and the resultant demand for imported wood also bo well for U.S. millwork exporters.—*Mitchel I. Auerba Office of Forest Products and Domestic Construction (2 377-0375, October 1990.*

PALLETS AND SKIDS

The pallets and skids industry (SIC 2448) produ wooden pallets and skids and wooden cargo containe pallets used in the storage and transportation of manuf tured goods. Shipments by the pallets and skids indus were valued at $1.9 billion in 1990, measured in const dollars, up approximately 1.4 percent over the 1989 lev

The pallets and skids industry is the largest domestic u of hardwood lumber, logs and cants, consuming an e mated 5.1 billion board feet (17.6 million cubic mete in 1990. Oak was the most commonly used hardwo specie, accounting for about one-third of the total v ume. The industry also consumed an estimated 1.7 billi board feet (4.0 million cubic meters) of softwood luml and 2.3 billion square feet (2.0 million cubic meters) softwood plywood and oriented strand board/waferbo in 1990.

The pallets and skids industry produced an estimated 5 million wooden pallets and skids in 1990, compared to 5

Trends and Forecasts: Wood Pallets and Skids (SIC 2448)

(in millions of dollars except as noted)

Item	1987	1988[1]	1989[2]	1990[2]	1991[3]	Percent Change 1987-88	1988-89	1989-90	1990
Industry Data									
Value of shipments[4]	1,496	1,822	1,987	2,104	—	21.8	9.1	5.9	-
Value of shipments (1987$)	1,496	1,792	1,835	1,860	1,885	19.8	2.4	1.4	1.
Total employment (000)	25.7	30.0	29.7	28.7	—	16.7	−1.0	−3.4	-
Production workers (000)	21.7	25.2	23.5	22.8	—	16.1	−6.7	−3.0	-
Average hourly earnings ($)	6.26	6.26	6.39	6.44	—	0.0	2.1	0.8	-
Capital expenditures	43.8	47.2	—	—	—	7.8	—	—	-
Product Data									
Value of shipments[5]	1,437	1,705	1,852	1,957	—	18.6	8.6	5.7	-
Value of shipments (1987$)	1,437	1,676	1,710	1,730	1,756	16.6	2.0	1.2	1.

[1] Advance data from the 1988 Annual Survey of Manufactures.

[2] Estimate.

[3] Forecast.

[4] Value of all products and services sold by establishments in the wood pallets and skids industry.

[5] Value of products classified in the wood pallets and skids industry produced by industries.

SOURCE: U.S. Department of Commerce: Bureau of the Census, International T Administration (ITA). Estimates and forecasts by ITA.

million in 1989. Production continued to be fairly evenly divided between higher valued reusable pallets, constructed for warehouse use or extended shipping applications and expendable pallets, constructed for limited use. Pallets come in a wide variety of types and sizes. However, the 48-inch by 40-inch double-faced, non-reversible, four-way entry pallet was the most frequently produced pallet.

Pallet prices held steady for most of 1990, but showed some upward movement during the fall on account of rising transportation costs brought on by the Mideast crisis. Some producers were reluctant to pass on higher productions costs, given the competitive nature of the industry and the recent downturn in the economy. Most pallet producers were only operating at 80 percent of capacity.

Pallet manufacturers made increasing use of the Pallet Design System (PDS) in 1990. PDS, a computer program that allows pallet manufacturers to design stringer and block pallets for specific performance requirements, enables pallet manufacturers to produce the best pallet for the job at the lowest cost. Pallet designs used to evolve through trial and error, and while most pallets have provided satisfactory service, they were seldom optimal.

Research initiated in 1988 to counter increased competition from plastic and metal pallets and changing market requirements resulted in the "enhanced wood" pallet in 1990. Researchers at Virginia Polytechnic Institute and State University (VPI) and the U.S. Forest Service Forest Product Laboratory were able to identify several commercially available products that when applied to pallets will (1) improve their ability to be sanitized, decontaminated, and cleaned; (2) improve their fire and flame resistance; (3) improve their decay-and-rot resistance; and (4) be non-toxic to pallet users. These products have, for the most part, been approved for use by the Food and Drug Administration, the Department of Agriculture, and Underwriters Laboratory.

Two large-scale pallet exchange (rental) programs, targeted at the grocery industry, began operations in 1990. The grocery industry—the largest user of pallets—was chosen, because of its material handling problems. First, failed pallets are reportedly contributing to excessive product damage and secondly, the grocery industry does not know what to do with pallets that are no longer serviceable. More and more municipal land fills, nationwide, will no longer take spent pallets. Pallet exchange programs appear to address both of theseconcerns. They offer the grocery industry an exceptionally high quality pallet which should reduce product damage, without a disposal problem since it is a rental.

Exports by the pallet and skids industry increased from $13.1 million in 1989 to an estimated $17 million in 1990. Canada and Mexico continued as the industry's leading export markets, accounting for 38 percent and 37 percent, respectively, of total export sales. Export sales to Japan also increased in 1990.

Imports of pallets and skids were valued at an estimated $7.0 million in 1990, compared to $4.0 million in 1989. Canada and Mexico were our leading foreign suppliers.

Outlook for 1991

Industry shipments are projected to increase by 1.3 percent in 1991, measured in constant dollars. This projection is based upon continued economic growth, albeit at a slow rate, and 12 percent growth in exports. The repair sector of the industry will continue to expand in 1991. New national pallet standards are on the horizon for 1991.

Long-Term Outlook

The long-term outlook for the pallet and skids industry is for 2 percent annual growth, measured in constant dollars. Exports will remain low relative to production, but they should continue to grow. Continued solid waste disposal problems will result in an increased proportion of reusable pallets relative to total production and continued growth of pallet exchange programs.—*C. Michael Hicks, Office of Forest Products and Domestic Construction, (202) 377-0375, October 1990.*

HARDWOOD VENEER AND PLYWOOD

U.S. hardwood plywood and veneer shipments totaled $2.2 billion in 1990. This industry (SIC 2435) manufactures panel products used in new construction, repair/remodeling applications, mobile homes, kitchen cabinets and furniture. With most of these markets registering flat sales—repair/remodeling being the exception—or showing modest declines in 1990, hardwood industry shipments were down 3 percent (1987 dollars). This decline follows a 2 percent drop in shipments registered in 1989. U.S. hardwood plywood production was an estimated 1.2 billion square feet surface measure (111.5 million square meters) in 1990, 3 percent

Trends and Forecasts: Hardwood Veneer and Plywood (SIC 2435)

(in millions of dollars except as noted)

						Percent Change			
Item	1987	1988[1]	1989[2]	1990[2]	1991[3]	1987-88	1988-89	1989-90	1990-91
Industry Data									
Value of shipments[4]	2,058	2,100	2,156	2,174	—	2.0	2.7	0.8	—
Value of shipments (1987$)	2,058	2,076	2,026	1,973	1,914	0.9	−2.4	−2.6	−3.0
Total employment (000)	20.5	20.6	20.4	20.2	—	0.5	−1.0	−1.0	—
Production workers (000)	17.4	17.3	17.1	16.9	—	−0.6	−1.2	−1.2	—
Average hourly earnings ($)	7.00	7.20	7.40	7.50	—	2.9	2.8	1.4	—
Capital expenditures	31.3	37.2	—	—	—	18.8	—	—	—
Product Data									
Value of shipments[5]	1,833	1,820	1,885	1,895	—	−0.7	3.6	0.5	—
Value of shipments (1987$)	1,833	1,780	1,744	1,692	1,641	−2.9	−2.0	−3.0	−3.0

[1] Advance data from the 1988 Annual Survey of Manufactures.

[2] Estimate.

[3] Forecast.

[4] Value of all products and services sold by establishments in the hardwood veneer and plywood industry.

[5] Value of products classified in the hardwood veneer and plywood industry produced by all industries.

SOURCE: U.S. Department of Commerce: Bureau of the Census, International Trade Administration (ITA). Estimates and forecasts by ITA.

off the 1989 figure and almost 50 percent below the industry's production peak reached in 1972.

Three main types of hardwood plywood are produced in the United States; stock panels, prefinished plywood and architectural and special cut to size panels. Stock panels, which comprise an estimated 62 percent of total production, are typically cut in standardized four feet by six-to-ten foot sizes and sold mostly to the plywood industry's major end-use markets and to do-it-yourself home repair centers. Architectural and specialty panels represent approximately 24 percent of total industry production. They are mostly used in furniture, cabinetry and special applications such as high-end decorative panels and furniture. Prefinished wall paneling, 14 percent of U.S. hardwood plywood production, is made from unfinished panels which are sanded, varnished and embossed before being shipped.

The number of industry establishments and employment has fallen since the 1970s as a result of steadily declining domestic markets and company consolidations, closures of older plants and modernization. The number of establishments is down from 366 in 1972 to an estimated 295 in 1989, while employment has declined from 25,100 to 20,200.

INTERNATIONAL COMPETITIVENESS

U.S. hardwood plywood and veneer exports totaled an estimated $236 million in 1990, up 30 percent over 1989 and a cumulative 85 percent above their 1987 level. Hardwood veneers accounted for an estimated 87 percent of the export mix, while the remainder consisted of hardwood plywood. U.S. hardwood veneer and plywood exports have trended upward recently, because of the weaker U.S. dollar, increased industry sophistication in foreign markets, and greater uncertainty regarding the supply of tropical hardwood products. The latter has resulted in increased consumer interest, especially in Europe, in plywood made from temperate hardwoods.

West Germany remains the leading U.S. hardwood veneer export market, accounting for 36 percent of total industry exports. Other major veneer markets were Canada which took 14 percent, followed by the Unided Kingdom (8 percent), and Japan (7 percent). Canada was the leading U.S. hardwood plywood export market, accounting for 39 percent of the export total while Mexico was the second leading foreign market, taking 29 percent. Hardwood plywood exports constituted about 3 percent of total plywood

American Plywood Association

A technician measures the deflection of a piece of plywood to simulate heavy floor loading.

industry shipments while the veneer producers exported about 35 percent of their output.

Despite the increase in industry exports, U.S. hardwood plywood trade remains largely one-sided with imports exceeding exports by almost three to one. The estimated 1990 import level of $698 million, a 2 percent increase over 1989, seemed to indicate a reversal of the previous two year trend of declining imports. However, most of the registered increase in the dollar value of U.S. hardwood plywood imports apparently resulted from large price hikes on plywood from Indonesia, the major U.S. foreign supplier.

On a volume basis, U.S. imports of hardwood plywood were down 15 percent from 1989. So far, because of its dominant position as a supplier, and its strength in the U.S. distribution channels, Indonesia has been able to maintain a series of price hikes on plywood exports to the United States. In 1990, Indonesia accounted for an estimated 59 percent (value basis) of U.S. hardwood plywood imports. Indonesian producers have developed a modern, low-cost plywood industry that enjoys ready access to low-cost labor and raw materials and which exports about 90 percent of its production.

Because of the sheer volume of their trade, Indonesian exporters have generally been able to extract higher product prices from their foreign buyers; their products account for about 70 percent of the total world plywood export market, with the United States, Japan and China as the leading customers. Taiwan (16 percent), Canada (7 percent), and Brazil (6 percent), were important secondary suppliers of the total U.S. hardwood plywood imports. U.S. hardwood veneer imports were shipped primarily from Canada (59 percent) and Brazil (12 percent).

Most of the U.S. hardwood plywood imports are in the form of unfinished hardwood panels, made mostly from lauan and other tropical species. An increasing proportion of the imports, however, consist of prefinished panels since Indonesian exporters are beginning to move actively into that market. About 15 percent of total imports consists of door skins used by wooden door manufacturers. Most of the imported door skins are manufactured from birch, meranti, lauan, or seraya plywood.

Outlook for 1991

Hardwood plywood industry shipments are forecast to decline by 3 percent in 1991 (in 1987 dollars) from their 1990 level. Continued weak performance by the industry's major end-use markets is expected to minimize the probability of any resurgence in plywood demand. However, U.S. imports of Indonesian plywood are forecast to continue falling on a volume basis, and to begin declining on a value basis as well because of expected weak U.S. markets and the resultant inability of Indonesian plywood exporters to continue raising prices.

Foreign markets will stand out as this industry's most significant growth area in 1991. U.S. hardwood veneer and plywood and veneer exports are forecast to grow by an additional 10 percent. Most of the increased plywood exports will be the result of additional sales to Canada and Mexico, while veneer exports, mostly to West Germany and Canada, will also increase.

Long-Term Prospects

The long-term outlook for the hardwood plywood industry will depend on developments in key markets such as construction, repair/remodeling and furniture, and policy measures by plywood producing countries in Southeast Asia and South America. The forecast is for a 2 percent annual decline in shipments during the next 5 years. Following a sluggish 1991-1993 period, an upturn in U.S. construction and repair/remodeling activities is expected by the mid-1990s. However, U.S. hardwood plywood producers are not expected to benefit substantially as this industry is expected to lose additional market share in interior wall paneling and mobile home markets to gypsum board manufacturers. Producers will also face increased competition from producers of particleboard, medium-density fiberboard, and hardboard in low cost furniture and cabinet markets.

While U.S. imports of hardwood plywood have leveled off, U.S. producers will face heightened competition from Indonesian exporters for its prefinished markets. Increased plywood imports from Malaysia and Brazil also are likely as those countries move toward value-added wood products exports. However, U.S. hardwood plywood exports are projected to continue expanding as the U.S. industry becomes more adept at marketing. The U.S. industry is also expected to assume a growing share of the world market traditionally held by producers of tropical hardwood plywood; spurred on by environmental concerns over tropical forest losses, consumer preferences in plywood importing countries will continue shifting away from tropical hardwood species. U.S. exporters of temperate hardwood plywood will, thus, be boosted by the increasingly uncertain supply situation facing importers of tropical plywood, many of whom are expected to turn to temperate hardwood plywood in place of tropical plywood. Moreover, if some of the various environmentalists-led proposals for consumer boycotts of tropical hardwood plywood occur, U.S. hardwood plywood exporters fortunes could be enhanced even more.—*Mitchel Auerbach, Office of Forest Products and Domestic Construction, (202) 377-0375, October 1990.*

SOFTWOOD VENEER AND PLYWOOD

Softwood veneer and plywood industry shipments (SIC 2436) totaled $4.9 billion in 1990. Shipments were up 1 percent (1987 dollars) during that year, after falling 5 percent in 1989. The U.S. softwood veneer and plywood industry continued to face generally stagnant domestic markets for most of its products and increased competition from producers of composite panel products. The plywood industry also faced increasingly tighter (and more expensive) timber supplies. Despite weak domestic markets, industry shipments actually posted a slight increase, since much of its productive capacity idled during sporadic labor strikes in 1989, was brought back on line and plywood producers were again able to resume shipments.

The June 1990 listing by the U.S. Fish and Wildlife Service (FWS) of the northern spotted owl marks a milestone in the confrontation between industry and environmentalists over how much old-growth Federal timber will be withdrawn from future cutting. The likely result will be about a 50 percent reduction in the annual allowable timber harvest off Federal lands in Region 6 (Oregon and Wash-

Trends and Forecasts: Softwood Veneer and Plywood (SIC 2436)

(in millions of dollars except as noted)

Item	1987	1988[1]	1989[2]	1990[2]	1991[3]	Percent Change 1987-88	1988-89	1989-90	1990-91
Industry Data									
Value of shipments[4]	4,926	4,829	5,147	4,932	—	−2.0	6.6	−4.2	—
Value of shipments (1987$)	4,926	4,870	4,608	4,648	4,416	−1.1	−5.4	0.9	−5.0
Total employment (000)	38.9	38.2	37,100	36,100	—	−1.8	−2.9	−2.7	—
Production workers (000)	35.1	34.6	33,500	32,400	—	−1.4	−3.2	−3.3	—
Average hourly earnings ($)	9.97	10.09	10.49	10.80	—	1.2	4.0	3.0	—
Capital expenditures	110	126	—	—	—	14.5	—	—	—
Product Data									
Value of shipments[5]	4,395	4,307	4,666	4,472	—	−2.0	8.3	−4.2	—
Value of shipments (1987$)	4,395	4,307	4,075	4,110	3,904	−2.0	−5.4	0.9	−5.0

[1] Advance data from the 1988 Annual Survey of Manufactures.

[2] Estimate.

[3] Forecast.

[4] Value of all products and services sold by establishments in the softwood veneer and plywood industry.

[5] Value of products classified in the softwood veneer and plywood industry produced by all industries.

SOURCE: U.S. Department of Commerce: Bureau of the Census, International Trade Administration (ITA). Estimates and forecasts by ITA.

ington). With the location of many plywood mills in small towns adjacent to Federal timber lands, much of the industry in Oregon and Washington is very sensitive to changes in the Forest Service and Bureau of Land Management allowable cut. Although the effects of the FWS decision were not directly felt in 1990, most observers feel that it will lead to a 15–20 percent reduction in softwood plywood production in the Pacific Northwest region.

U.S. softwood plywood production totaled an estimated 21.6 billion square feet (3/8-inch basis) (19.1 million cubic meters) in 1990, compared to 21.4 billion square feet (18.9 milliom cubic meters) in 1989. The South was the leading U.S. softwood plywood-producing region in 1990, supplying an estimated 55 percent of the country's total output, followed by the Pacific Northwest, which accounted for 34 percent. Production began in the South in the mid-1960's, following the development of manufacturing techniques to handle the uneven growth characteristics and high natural resin content of Southern species. Since the mid 1970s, the Pacific Northwest has declined in importance as a plywood producing region, while the South has continued to grow. Much of the recent decline in the Pacific Northwest also has been due to the rapidly rising cost and decreased availability of timber.

American Plywood Association (APA) data indicate that in 1990, new residential construction was the largest single market for the softwood plywood and veneer industry, accounting for 42 percent of domestic industry shipments. Industrial applications, such as transportation equipment and materials handling was second with 20 percent of industry shipments. Repair/remodeling was the third leading market, with 19 percent. Repair/remodeling has slowed its previously rapid growth; still, it has become increasingly important with the decline in U.S. residential construction since 1986. Non-residential construction markets accounted for 16 percent of shipments, while miscellaneous markets, such as civilian government and military purchases, accounted for the remainder.

In 1990, there were 126 softwood plywood establishments in operation, down from 132 in 1989 and 142 and in 1988. While some plywood mills have succumbed to poor market conditions, others have closed because of high timber prices (especially in the Pacific Northwest) and log availability problems. Industry employment was down 3 percent in 1990, to 36,100, reflecting mill closures in the Pacific Northwest, as well as production cutbacks in operating plywood plants.

U.S. softwood plywood prices were up 3 percent during the first 8 months of 1990 compared with the same period in 1989. However, they finished the summer about 10 percent off those of summer 1989, reflecting the generally poor domestic market conditions facing most U.S. producers. Plywood prices exhibited great volatility as they did in 1989, especially relating to reports on the spotted owl in the Pacific Northwest. Plywood producers also continued to face rising raw material costs. For example, in the Pacific Northwest, U.S. Forest Service Douglas-fir timber prices (Westside Washington and Oregon) jumped almost 50 percent between the first quarter of 1989 and the same period in 1990; since 1985, they have increased a cumulative 345 percent.

U.S. softwood plywood producers continue making technological advances and productivity improvements in order to control costs and remain competitive. Raw material consumption per unit of product has declined through the use of spindless lathes that can handle smaller diameter logs and that enable mills to peel down to about a 3-inch core. Computerized clipper scanners that can spot defects in veneer panels on a continuous basis have become fairly common throughout the plywood industry. Also, gluing and drying times for softwood plywood have been pared through the development of new glues. While continued technological advances and productivity improvements have enabled the plywood industry to remain generally profitable, rising raw material costs are straining many producers.

INTERNATIONAL COMPETITIVENESS

U.S. softwood plywood and veneer exports totaled an estimated $365 million in 1990, up 25 percent over 1989. The weaker dollar, a sustained industry-sponsored foreign market development program and continued economic growth in most U.S. trading partners have been the main factors driving the strong expansion in foreign sales, which have more than tripled in value since 1985. Softwood plywood comprised 95 percent of the export mix (value basis) while softwood veneer accounted for the remainder. Exports comprised about 7 percent of the total value of industry shipments.

The European Community (EC) was the largest regional market for U.S. plywood exporters taking an estimated 80 percent of the total. The United Kingdom, the largest single foreign market, purchased 25 percent of total industry exports. Next came Belgium (16 percent), Canada (13 percent), and the Netherlands (10 percent). Softwood veneer exports went primarily to Canada (52 percent), and Japan (23 percent).

An agreement has apparently been reached on the long-standing standards dispute with Canada concerning CDX plywood (the most common U.S. softwood plywood grade). As a result, Canada is expected to eventually permit the use of U.S.-produced CDX plywood in construction. The agreement could also pave the way for the staged elimination of U.S. and Canadian tariffs on softwoods plywood, OSB/waferboard and particleboard provided for as part of the U.S.-Canada Free Trade Agreement. In February, 1990, a binational technical committee made recommendations for the drafting of a common plywood standard in both countries. Final resolution of this issue is expected within a couple of years when the binational committee has drafted a common performance standard for plywood and the standard has been incorporated into building codes.

Softwood plywood and veneer imports totaled an estimated $25 million in 1990, down 8 percent from 1989. Canada supplied 38 percent, followed by Indonesia (19 percent) and Finland (19 percent). Brazil, Mexico, and the Philippines were important secondary suppliers, each accounting for about 5-10 percent of total U.S. imports. Canadian, Mexican and Finnish exporters ship primarily temperate softwood plywood species to U.S. markets, while the plywood imported from Indonesia, the Philippines and Brazil consists primarily of Agathis plywood and other tropical softwoods. Softwood veneer imports (80 percent from Canada) accounted for about 40 percent of the import total.

Outlook for 1991

The availability of timber in the Western United States will continue to be one of the biggest concerns for the U.S. softwood plywood industry in 1991. The conflict between environmentalists, the Federal Government and the timber industry over how much of the remaining old-growth forests in the West will be cut is not expected to be completely resolved anytime soon. The Federal Government's revised management plans for Forest Service and Bureau of Land Management lands will, however, result in less available timber in the Pacific Northwest. This, and continued soft domestic markets are expected to result in a 5 percent decline in industry shipments (constant dollars) in 1991.

Exports are forecast to increase by 15 percent in 1991 as plywood industry market development programs in the Pacific Rim region and Europe continue bearing fruit. The recent Japanese concessions on tariff and non-tariff barriers on finished wood products bodes well for expanded U.S. plywood exports to that country as well as other Pacific Rim countries. The ongoing democratization and economic revitalization in Eastern Europe combined with increased U.S. industry promotional activities are expected to boost sales of U.S. softwood plywood sales to that region.

Long-Term Outlook

Following a 1 to 2 percent decline during the first couple of years in the 1990s, industry shipments are expected to increase slightly on the heels of an expected recovery in U.S. housing starts and repair/remodeling activities. This forecast is made assuming about a 10-15 percent reduction in total available timber in the Pacific Northwest but stable timber supplies elsewhere. If the environmental litigation currently focused in the Pacific Northwest spreads to other parts of the country, resulting in withdrawals of forest lands from timber management, then plywood producers would face even tighter raw material supplies.

Softwood plywood manufacturers are expected to lose additional market share to producers of oriented strandboard (OSB) and waferboard, especially as they are forced to pay higher prices for increasingly scarce veneer grade logs. The producers of OSB/waferboard who have been competing successfully against plywood on a price basis, have increased their production almost tenfold since 1982, and now account for 21 percent of structural panels production. Within 5 years OSB/waferboard producers are forecast to be supplying about 30 percent.

Overseas markets will continue to provide the best long-term growth potential for U.S. plywood producers. The industry's strong export promotion program and long tradition of exporting combined with the continued erosion of tariff and non-tariff barriers in many U.S. trading partners will encourage continued overseas market growth. Although the EC will remain the industry's largest regional market, U.S. plywood producers will be focusing on the Pacific Rim countries for expanded sales. Japan and South Korea offer the greatest potential, because of the inability of those countries' plywood industries to satisfy their markets. U.S. softwood plywood exports to Eastern Europe are also expected to increase as U.S. exporters work toward supplying construction markets in that region's newly democratized countries.—*Mitchel I. Auerbach, Office of Forest Products and Domestic Construction. (202) 377-0375, October 1990.*

WOOD PRESERVATION

The wood preservation industry (SIC 2491) produces treated lumber and timbers, crossties, poles, plywood, and related wood products. These products are treated with wood preservatives and fire retardants. Following a surprisingly sharp downturn in value of industry shipments in 1989, the wood preservation industry posted a 6.7 percent increase in 1990, measured in constant dollars. Industry shipments were valued at $2.4 billion in 1990.

There were an estimated 575 treating plants in the United States (including Puerto Rico) in 1990; the greatest concentration of plants was found in the South. It is estimated that the wood preservation industry treated over 550 million cubic feet (15.4 million cubic meters) of lumber and related wood products in 1990, much of it southern yellow pine lumber. The industry's products are used in a wide range of construction applications, with the repair and renovation market being its largest end-use market.

Two methods are commonly used to apply wood preservatives. Most treating plants (95 percent) utilize a pressure process, i.e. a change in pressure, to apply the preservative. This procedure expedites the movement of the wood preservative into the wood; it also effects deeper penetration. Tests have shown that pressure treated wood can last 35 years or longer (untreated wood lasts as little as three years), even when in contact with the ground. The remaining plants utilize a non-pressure process, i.e. the wood preservative is applied at normal atmospheric pressure.

Trends and Forecasts: Wood Preserving (SIC 2491)

(in millions of dollars except as noted)

Item	1987	1988[1]	1989[2]	1990[2]	1991[3]	Percent Change 1987-88	1988-89	1989-90
Industry Data								
Value of shipments[4]	2,170	2,217	2,209	2,412	—	2.2	−0.4	9.2
Value of shipments (1987$)	2,170	2,155	1,999	2,133	2,159	−0.7	−7.2	6.7
Total employment (000)	11.8	11.5	11.4	11.3	—	−2.5	−0.9	−0.9
Production workers (000)	9.1	8.6	8.5	8.4	—	−5.5	−1.2	−1.2
Average hourly earnings ($)	7.73	8.08	8.35	8.46	—	4.5	3.3	1.3
Capital expenditures	44.1	41.9	—	—	—	−5.0	—	—
Product Data								
Value of shipments[5]	2,152	2,211	2,193	2,406	—	2.7	−0.8	9.7
Value of shipments (1987$)	2,152	2,139	1,983	2,116	2,141	−0.6	−7.3	6.7

[1] Advance data from the 1988 Annual Survey of Manufactures.
[2] Estimate.
[3] Forecast.
[4] Value of all products and services sold by establishments in the wood preserving industry.
[5] Value of products classified in the wood preserving industry produced by all ind
SOURCE: U.S. Department of Commerce: Bureau of the Census. Internation
Administration (ITA). Estimates and forecasts by ITA.

This procedure can also be very effective, depending upon the specie of wood being treated and the product's intended end-use.

Wood preservatives generally fall into one of three broad classes: creosote solutions, pentachlorophenols, and waterborne preservatives. Over 75 percent of the industry's output was treated with waterborne preservatives in 1990, primarily chromated copper arsenate (CCA). In addition to CCA, other EPA-approved wood preservatives include ammonical copper zinc arsenate, copper napthenate, zinc napthenate, and acid copper chromate.

Productivity in the wood preservation industry varies with, among other things, the equipment being used, the specie of wood being treated, the type of treatment, and the plant's product mix. Generally, output per employee is substantially higher at plants treating with waterborne preservatives than at plants treating with creosote solutions or pentachlorophenols, or a combination of wood preservatives. Similarly, output is generally higher at plants producing a single product than at plants producing a mix of products.

In addition to treating wood products with wood preservatives, the industry also treats wood products with fire retardants. Fire Retardant Treated (FRT) lumber and plywood is permitted to be used in lieu of noncombustible materials under several major building codes. FRT wood accounted for about 2 percent of the industry's output, on a volume basis, in 1990.

A major use of FRT plywood is roof sheathing at party-separation walls in multi-family residential construction such as townhouses. Over the last several years, there have been a number of reported structural failures of FRT plywood. It appears that some FRT plywood—especially FRT plywood treated with formulations containing monoammonium phosphate—undergoes a chemical reaction and loses its structural integrity when exposed to high heat and humidity. According to the National Association of Home Builders, up to 1 million multi-family residences in the eastern United States (most building codes in the West require fire walls) could be affected. There have also been reported failures in office buildings, prisons, and nursing homes. Responsibility for repairs may ultimately lie in the hands of the court, since there is a disagreement as to who is at fault.

As of early October 1990, the anticipated ruling by the Environmental Protection Agency as to how the industry's preservative wastes would be regulated had not materialized. The regulations which have been in the making for
several years were due out in final form by July 199
now it appears that they will not be out until late Nove
In the past, EPA has implied that it might use the Res
Conservation and Recovery Act to regulate these wastes
industry continues to favor a multi-statute approach.

Exports of treated wood products, primarily poles/p
and lumber, were valued at $49.7 million in 1990. Canad
the industry's leading export market, accounting f
percent of total export sales. Mexico was a distant se
with 4 percent of sales. The Caribbean was an impo
regional market, accounting for 20 percent of export

Imports of treated wood products, primarily pole
pilings, were valued at $27.9 million in 1990. Canad
our major foreign supplier of treated wood products

Outlook for 1991

Shipments of treated wood products are project
increase by 1.2 percent, measured in constant dollars, in
This projection is based, in large part, upon continued g
in the residential remodeling and renovation marke
industry's main end-use market. Exports should b
slightly in 1991 as the industry continues to place
emphasis on developing overseas markets.

Long-Term Prospects

The wood preservation industry has grown rapidly
the past decade. However, the industry is beginni
show signs of maturity. If the industry is to contin
rapid growth, it can only do so by introducing
products. Otherwise, shipments will tend to rise an
with the residential construction market. However, co
ued growth in the remodeling and renovation marke
help moderate some of the fluctuation.

Exports will remain low relative to total productio
they should continue to grow. The industry will increa
place more emphasis on overseas markets. Imports, pri
from Canada, will continue to increase.—*C. Michael*
Office of Forest Products and Domestic Construction,
377-0375, October 1990.

RECONSTITUTED PANEL PRODUCT

Shipments for this industry (SIC 2493) were valu
$2,948 million in 1990. Shipments were up 1 percent
dollars) from 1989, making 1990 the eighth conse

year of growth for this industry, (except for 1988 when it declined by 0.1) and which since 1982 has more than doubled its shipments. However, the value in shipments expressed in current dollars declined as a result of lower market prices for most of this industry's products. With the exception of OSB/waferboard producers, manufacturers experienced generally soft market demand in 1990 from their major markets; construction and furniture.

Particleboard and medium density fiberboard (MDF) were the two most important products in this industry, accounting for 39 percent of total product shipments, followed by hardboard (24 percent), OSB/waferboard (23 percent), and prefinished particleboard/MDF (7 percent), insulation board (6 percent), and miscellaneous product shipments (1 percent).

This industry grouping is a new classification created by the U.S. Bureau of the Census and first reported in its *1987 Census of Manufactures*. It is comprised of six separate products: particleboard, medium density-fiberboard (MDF), hardboard, oriented strandboard and waferboard (OSB/waferboard), insulation board, and prefinished particleboard and MDF. Each of these employ different production techniques and serve generally different markets. A discussion of each product is presented and a brief narrative for the entire SIC 2493 group—with supporting statistics is also provided.

Producers of reconstituted panel products continued to feel the impact of complying with the government's new wood dust standards, implemented by the Occupational Safety and Health Administration (OSHA) early in 1989. Although exact compliance costs are not available, some of the more marginal producers of these products have undoubtedly been strained to comply.

Particleboard and MDF

Particleboard is a composite panel product made mostly from wood residues that are bonded under heat and pressure with a urea formaldehyde adhesive and then shaped into panels. Medium-density fiberboard (MDF) is also made from wood residues. MDF is manufactured by heating wood residues under pressurized steam (which breaks down the natural lignins binding the particles together), before being bonded into wood fibers. The fibers are later blended and matted in a panel formation process similar to that used in the production of particleboard.

There are 45 particleboard and 13 MDF establishments, located throughout the country. According to the National Particleboard Association (NPA), Oregon (30 percent), Mississippi (10 percent), and Virginia (19 percent), were the leading particleboard producing states in 1990. MDF production in 1990 was mostly in South Carolina (15 percent), North Carolina and California (each 13 percent), and Alabama and Arkansas (each 12 percent).

U.S. particleboard shipments totaled an estimated $886.7 million in 1990, virtually unchanged (1987 dollars) from the previous year. On a volume basis, particleboard production totaled an estimated (3/4-inch basis) 3,870 million square feet (6.8 billion cubic meters) in 1990, the second year without growth. This is in contrast to the 1982-88 period of steady growth when production increased by a cumulative 60 percent. U.S. market demand for particleboard has slowed considerably from the mid-1980s, because of a general moderation in demand from most particleboard markets and encroachment by MDF producers in many of its markets, particularly furniture. According to the NPA, U.S. particleboard productive capacity totaled 4,511 million square feet (8.0 billion cubic meters) in 1990, up 4 percent from 1989. About 57 percent of U.S. particleboard productive capacity is located in the eastern part of the country (including Texas). In 1990, industry capacity utilization was an estimated 86 percent.

U.S. MDF shipments were valued at $304.3 million in 1990, up a modest 1 percent (1987 dollars) from 1989. Since 1982, constant dollar MDF shipments have grown by 121 percent. U.S. MDF production was an estimated (3/4-inch basis) 985 million square feet (1.7 million cubic meters) in 1990, compared to 970 million square feet (1.7 million cubic meters) in 1989 and 446 million square feet (800,000 cubic meters) in 1982. Productive capacity stood at 1,035 million square feet (1.8 million cubic meters) in 1989, while capacity utilization was an estimated 95 percent.

Particleboard is used mostly in the manufacture of furniture, doors, cabinets, and fixtures, which accounted for about 86 percent of total shipments. Particleboard producers compete with manufacturers of hardwood plywood, hardboard, MDF, lumber, and metal products for these markets. Flooring underlayment was the second largest particleboard market taking an estimated 10 percent of total shipments. Particleboard producers have been losing their share in this market since the late 1970s to softwood plywood, OSB/waferboard, imported hardwood plywood, lumber, and hardboard. Most of the remaining

Trends and Forecasts: Reconstituted Wood Products (SIC 2493)

(in millions of dollars except as noted)

Item	1987	1988[1]	1989[2]	1990[2]	1991[3]	Percent Change 1987-88	1988-89	1989-90	1990-91
Industry Data									
Value of shipments[4]	2,865	2,927	3,073	2,948	—	2.2	5.0	-4.1	—
Value of shipments (1987$)	2,865	2,862	2,961	3,002	2,948	-0.1	3.5	1.4	-1.8
Total employment (000)	22.0	22.5	22.5	22.8	—	2.3	0.0	1.3	—
Production workers (000)	17.7	18.2	18.2	18.5	—	2.8	0.0	1.6	—
Average hourly earnings ($)	9.98	10.14	10.50	10.86	—	1.6	3.6	3.4	—
Capital expenditures	150	147	—	—	—	-2.0	—	—	—
Product Data									
Value of shipments[5]	2,896	2,990	3,139	3,042	—	3.2	5.0	-3.1	—
Value of shipments (1987$)	2,896	2,923	3,024	3,066	3,007	0.9	3.5	1.4	-1.9

[1] Advance data from the 1988 Annual Survey of Manufactures

[2] Estimate

[3] Forecast

[4] Value of all products and services sold by establishments in the reconstituted wood products industry

[5] Value of products classified in the reconstituted wood products industry produced by all industries.

SOURCE: U.S. Department of Commerce: Bureau of the Census, International Trade Administration (ITA). Estimates and forecasts by ITA.

particleboard shipments went into mobile decking (which has been declining since the 1970s) and structural panels. Over 95 percent of MDF goes into furniture production while most of the remainder is used in the manufacture of cabinets and fixtures.

U.S particleboard exports were an estimated $61 million in 1990, while MDF shipments to overseas markets totaled $48 million. Exports, which have more than doubled since 1985, were up an additional 35 percent in 1990 over 1989. Growing demand from the Pacific Rim's export oriented furniture manufacturers has been largely responsible for the rapid growth in U.S. exports. Canada was the largest particleboard export market, purchasing 29 percent of the U.S. total, followed by South Korea (25 percent), Mexico (21 percent), and Taiwan (9 percent). U.S. exports of MDF went mostly to Taiwan (31 percent), South Korea (18 percent) and Canada (13 percent).

Particleboard and MDF imports were valued at an estimated $86 million in 1990, down 26 percent from 1989. Particleboard comprised 90 percent of the import product mix. Canada supplied about 85 percent of total U.S. particleboard imports while Mexico supplied most of the rest. Most U.S. imports of MDF were shipped from Canada (61 percent), Argentina (13 percent) and Mexico (10 percent).

OSB/waferboard

Despite generally soft domestic construction, OSB/waferboard manufacturers expanded further in 1990 as they continued to capture market share from softwood plywood producers. In 1990, U.S. OSB/waferboard product shipments totaled $694.5 million, up 9 percent (1987 dollars) over 1989, and 35 percent over their 1987 level. U.S. production of OSB/waferboard has surged since 1980, when it totaled (3/8-inch basis) 196 million square feet (173,000 cubic meters) to an estimated 5,550 million square feet (4.9 million cubic meters) in 1990. The U.S. industry, which began in 1973 with a single mill in Minnesota has rapidly expanded, especially since 1980, to 29 establishments with a total productive capacity of 6,140 million square feet (5.4 million cubic meters). Canadian exports of OSB/waferboard to U.S. markets totaled an estimated 1,600 million square feet (1.4 million cubic meters) in 1990. Including imports from Canada, this composite panel accounts for about 26 percent of the total structural panels market (shared with softwood plywood), compared with 1 percent in 1980.

OSB/waferboard is a composite panel made from wafer-sized wood chips and strands, which are coated with a wax and resin (usually phenolic-based) before being bonded under heat and pressure. Producers of OSB/waferboard use roundwood as their basic raw material, unlike manufacturers of other reconstituted panel products, who rely mostly on mill wastes such as edgings, sawdust and trimmings. The increased scarcity and higher cost of large, veneer grade logs used in plywood production have been the major factors driving the wood products industry to develop panel products made from smaller, less expensive timber. The North Central region where U.S. OSB/waferboard. production began, is still the leading producing region, supplying an estimated 41 percent of the U.S. total. Other OSB/waferboard producing regions are the Southeast (25 percent), the Southwest (18 percent), the Northeast (9 percent), and the West (7 percent).

OSB/waferboard producers ship their products to most of the same domestic markets as manufacturers of softwood plywood, and the two panel products are generally manufactured to the same product grades and standards. New residential construction is the largest market taking an estimated 39 percent of shipments. The repair/remodeling market accounted for about 24 percent and non-residential construction 15 percent, while the remaining OSB/waferboard was used in miscellaneous applications such as transportation equipment and materials handling. OSB/waferboard has already gained wide acceptance in roof and wall sheathing and flooring applications. Producers have recently begun marketing an exterior siding made from OSB/waferboard, which is bonded with a more water resistant isocyanate-based resin and embossed with a resin-coated paper overlay.

U.S. exports of OSB/waferboard were estimated to total $16 million in 1990, mostly to the European Community. Imports of OSB/waferboard into the United States (virtually all from Canada) totaled $132 million in 1990, up approximately 55 percent over 1989. Canada exports about 60 percent of its OSB/waferboard production to the United States and as its industry has continued to expand, so have its shipments to U.S. markets. In 1990, Canada's OSB/waferboard producers had a productive capacity of about 2,915 million square feet (2.6 million cubic meters), and consisted of 15 mills, up from 13 in 1988. Imported OSB/waferboard supplied about 16 percent of the U.S. market.

Hardboard

U.S. hardboard product shipments were valued at $729.5 million in 1990, down 1 percent (1987 dollars) from 1989. Except for a modest increase in 1989, U.S. hardboard demand has been on a downward trend since 1983 primarily because producers have been losing market share, especially in siding, to softwood plywood and OSB/waferboard. Interior paneling, traditionally an important market for hardboard producers, has also declined because of shifting consumer preference in favor of gypsum board. Builders have also moved away from using hardboard in flooring, to using thicker single-floor systems made from softwood plywood or OSB/waferboard. U.S. hardboard production in 1990 (1/8-inch basis) was an estimated 5,150 million square feet (1.5 million cubic meters), compared to 1983, when it totaled 7,303 million square feet (2.2 million cubic meters). Industry productive capacity was an estimated 6,784 million square feet (2.0 million cubic meters) with a capacity utilization of about 76 percent in 1990, down from 91 percent in 1983. Since 1983, several U.S. hardboard mills have closed while others have scaled back operations.

Hardboard is made from wood fibers which have been consolidated under heat and pressure to form panels, using only a minimal amount of resin because of the relatively high heat and pressure under which it is produced. According to the American Hardboard Association (AHA), it is used mostly in residential construction applications, which consumed 35 percent of the industry's production. Industrial applications; including furniture, cabinets, etc., was the second largest market with 29 percent. The residential repair/remodeling market accounted for another 24 percent while hardboard used in non-residential construction comprised the remainder.

In 1990, the hardboard industry consisted of 21 mills; 8 in the West, 7 in the South, 5 in the Midwest, and 1 in the Northeast. The South was the leading hardboard producing region, supplying an estimated 52 percent of the country's total, followed by the West (23 percent), the Midwest (15 percent), and the Northeast (10 percent).

The hardboard producers registered additional growth in foreign sales, with exports increasing an estimated 17 percent in 1990, to $51.6 million. Since 1985, hardboard exporters have doubled their shipments to foreign markets. In 1990, exports comprised about 7 percent of total shipments. Canada was, by far, the leading foreign market, taking 66 percent of all U.S. exports, followed by Australia and Taiwan (each 5 percent). U.S. hardboard imports decreased an estimated 1 percent in 1990, to $48 million. Brazil was the leading foreign supplier of hardboard to the United States, accounting for about 44 percent of the import total, followed by Canada which accounted for 34 percent. Brazilian hardboard is widely used in the manufacture of extra-wide garage doors, flat interior flush doors and tileboard. Other, secondary, sources of imported hardboard included Mexico, which accounted for 10 percent of U.S. hardboard imports and the Soviet Union and Argentina, which each accounted for about 5 percent of the U.S. import total.

Other Reconstituted Panel Products

Product shipments of prefinished particleboard and MDF totaled $225.1 million in 1990, down 5 percent (1987 dollars) because of slack market demand from construction and furniture markets. The decline in shipments was the first reversal of the post-1982 period of steady growth for this industry, during which product shipments grew an estimated 60 percent. Prefinished products are manufactured by embossing, laminating or applying a pattern to the basic particleboard or MDF panel to simulate a wood grain or some other pattern. They are widely used in the production of furniture, cabinets and fixtures, while a limited quantity are also used in wall paneling.

Insulation board shipments, valued at $201.9 million in 1990, were down 3 percent from 1989. The decline in the construction market was the major factor in the reduced shipments. The decline in shipments also reflected the steady downward trend in demand for wood-based insulation panels that has been occurring since the 1970s. Substitute insulating products, most notably plastic foams, fiberglass and cellulose insulation materials have been cutting deeply into insulation board's traditional markets. Insulation board is made from fibers (usually wood) that have been felted, dried, cut, and trimmed. The panel's insulating properties are gained by entrapping large quantities of air pores between the individual wood fibers during the felting process. Insulation board is used primarily in building construction and repair/remodeling applications. About 90 percent goes into exterior uses, such as roof and wall sheathing, while the rest is used mostly in the production of ceiling tiles and ceiling panels.

Outlook for 1991

With the exception of OSB/waferboard, shipments for all of the individual products within this industry grouping are expected to be down in 1991. Constant dollar shipments for SIC 2493 are forecast to decline by 2 percent in 1991 from their 1990 level. Growth in market demand for OSB/waferboard will occur primarily as result of continued encroachment by its producers into softwood plywood markets since new construction is expected to decline in 1991. Particleboard and MDF shipments are forecast to decline by 2 percent because of continued weak demand from its major end-user markets; furniture and cabinets. For the same reason, prefinished particleboard and MDF shipments are also expected to be down by 3 percent in 1991. Hardboard shipments are forecast to decline by 4 percent as producers face further inroads into their siding markets by producers of softwood plywood, OSB/waferboard, vinyl, brick, and aluminum siding. Insulation board manufacturers will also experience a 3 percent drop in shipments because of the reduced construction activity and a continued market shift to alternative materials, especially foamed plastic boards.

Long-Term Prospects

Following a period of flat market demand in 1992-93, industry shipments for SIC 2493 are projected to grow slowly during the mid-1990s, based on an expected recovery in construction activity after 1992. Although reconstituted panel producers will remain closely tied to the level of new construction, they will continue looking to the repair/remodeling and furniture markets for most shipments growth.

Shipments by the particleboard and MDF industry are projected to show a slow growth pattern through the mid-1990s, with producers remaining closely linked to their furniture, cabinetry and fixtures markets. Producers will continue focusing most of their efforts on the higher-value industrial markets while shipments to the underlayment and manufactured housing markets are expected to further decline. Particleboard and MDF exports are expected to register steady expansion over the next few years, especially if the U.S. dollar remains weak and the economies of the leading U.S. trading partners remain healthy. Exports to Japan, South Korea and Taiwan, can be expected to show substantial growth if the expected raw material supply shortfall in that region materializes. Continued growth in these markets could be a double-edged sword, however, since domestic furniture manufacturers, another important industry market, could be adversely affected by increased U.S. imports of furniture.

U.S. OSB/waferboard shipments are forecast to expand by 5 to 10 percent annually over the next several years, with virtually all of the growth occurring at the expense of softwood plywood. As veneer grade logs become increasingly scarce, OSB/waferboard producers will find themselves at a competitive advantage, since they are able to utilize the smaller-diameter trees which will still be relatively abundant. American Plywood Association data indicate the possibility of as many as 8 new mills will be constructed over the next 5 years, which would result in nearly a 40 percent increase in productive capacity. Within 5 years, OSB/waferboard shipments are expected to account for about 30 percent of the structural panel total. International markets also offer great potential for U.S. producers. U.S. companies can be expected to expand further on their initial marketing efforts in Europe and Japan, begun in the late 1980s. Exporters will be focusing most of their efforts in these region's sheathing, flooring, and siding markets. Japan, especially, holds great potential as a major OSB/waferboard export market with the recent approval by the Japanese Ministry of Construction for its use in residential construction.

Hardboard shipments are expected to continue declining, because of soft markets and further inroads into the hardboard siding markets by producers of other panel products. Most of the hardboard industry's domestic shipments will continue going to the new construction and repair/remodeling sectors. Industry exports are projected to increase, counteracting some of the decline in domestic markets. Canada will remain the leading foreign market for U.S. hardboard exporters, although exports to the Pacific Rim are expected to show the greatest percentage growth.

Despite some growth in demand from some of its markets, such as roof decking in homes under renovation, U.S. wood fiber insulation board shipments will remain in a state of contraction, mostly because of further decline in panels used in sheathing applications. Wood fiber insulation board manufacturers will continue to lose market share to manufacturers of plastic foam insulating materials, suppliers of about 60 percent of the commercial and residential sheathing markets. Exports—mostly to Canada—will continue to increase, especially as the U.S.-Canada Free Trade Agreement leads to a reduction in both countries' tariffs. U.S. insulation board exports to the Pacific Rim are also forecast to continue expanding. However, foreign sales will still comprise a small proportion of total shipments.—*Mitchel I. Auerbach, Office of Forest Products and Domestic Construction (202) 377-0375, October 1990.*

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7

Construction Materials

Constant dollar shipments for the 15 industries covered in this chapter are expected to decline 3.3 percent in 1991, compared with a decline of less then 1 percent in 1990. The largest decreases will be in the flat glass and fabricated structural metal industries; the smallest will be for plumbing fixtures and fittings. Only the mineral wool industry is expected to show a gain.

Before reading this chapter, please see "How to Get the Most Out of This Book" on page 1. It will clarify questions you may have concerning data collection procedures, factors affecting trade data, forecasting methodology, the use of constant dollars, the difference between industry and product data, sources and references, and the Standard Industrial Classification system (SIC).

Construction materials industries experienced lower demand in 1990, reflecting a 1.5 percent decline in construction activity (in constant dollars) from 1989. Four consecutive years of declining housing starts have had a negative effect on makers of materials used in new residential construction. In 1990, housing starts dropped 9 percent to about 1.25 million from 1.38 million units in 1989. Of the total, multifamily housing starts declined 13 percent, while single-family starts dropped 8 percent. The long-term slide in manufactured (mobile) home shipments continued in 1990, decreasing about 8 percent from 1989.

The decline in new housing units has been offset somewhat by a trend toward larger houses and more amenities. For example, new single-family homes in 1989 averaged 2,035 square feet compared with an average of 1,780 square feet in 1984 and 1,995 in 1988. Two-car garages, central air conditioning, additional bedrooms and bathrooms, fireplaces, and basements all have helped to keep demand for building materials from declining even more. The trend toward bigger houses may have peaked, however. (For additional information, see chapter 5, Construction.)

Along with residential construction, private nonresidential construction also was down in 1990, declining 2 percent on an inflation-adjusted basis. Office building construction was down about 12 percent, and other commercial construction was down 5 percent. On the plus side, the industrial sector rose 10 percent and hotel/motel construction was up 5 percent.

Public construction in 1990 rose 6 percent, with educational buildings up 14 percent, other public buildings up 7 percent, highway construction up 1 percent, and nonbuilding construction up 5 percent.

The alterations, additions, and repairs market continued to play an important—and growing—role. Residential expenditures, which reached $101 billion in 1988, were about $106 billion in 1989, and about $111 billion in 1990. Nonresidential renovation and repair work is estimated to be about the same value as residential. Many manufacturers produce products especially designed for easy installation by small contractors and do-it-yourselfers.

Prices of construction materials rose slightly in 1990 (Table 1). The Producer Price Index for all construction materials went up only 0.5 percent in 1990, compared with increases of 3.3, 5.7, and 2.1 percent in the three previous years. Non-lumber construction products that had the

Trends and Forecasts: Construction Materials

(industry shipments in millions of 1987 dollars)

						Compound Annual	Percent Change		
							Annual		
	Item	1988	1989	1990	1991	1988-91	1988-89	1989-90	1990-91
	TOTAL	52,322	52,609	52,242	50,537	−1.15	+0.5	−0.7	−3.3
3088	Plastic plumbing fixtures	809	837	739	720	−3.81	+3.5	−11.7	−2.6
3211	Flat glass	2,410	2,458	2,507	2,382	−0.39	+2.0	+2.0	−5.0
3241	Hydraulic cement	4,222	4,197	4,281	4,148	−0.59	−0.6	+2.0	−3.1
3251	Brick & structural tile	1,216	1,176	1,175	1,129	−2.44	−3.3	−.1	−3.9
3253	Ceramic wall/floor tile	729	844	785	758	1.31	+15.8	−7.0	−3.4
3261	Vitreous plumbing fixtures	910	937	999	983	2.61	+3.0	+6.6	−1.6
3271	Concrete block & brick	2,310	2,381	2,340	2,259	−0.74	+3.1	−1.7	−3.5
3272	Concrete products NEC	6,104	6,206	6,077	5,853	−1.39	+1.7	−2.1	−3.7
3273	Ready mix concrete	12,825	12,466	12,316	11,947	+2.34	−2.8	−1.2	−3.0
3275	Gypsum products	2,598	2,634	2,621	2,569	−0.37	+1.4	−0.5	−2.0
3296	Mineral wool	3,256	3,276	3,282	3,300	0.45	+0.6	+0.2	+0.5
3431	Metal sanitary ware	909	874	844	829	−3.02	−3.9	−3.4	−1.8
3432	Plumbing fixturers fittings	2,332	2,346	2,310	2,300	−0.46	+0.6	−1.5	−0.4
3441	Fabricated structural metal	8,571	8,700	8,613	8,182	−1.54	+1.5	−1.0	−5.0
3448	Prefab metal buildings	3,121	3,277	3,310	3,178	0.61	+5.0	+1.0	−4.0

SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration.

largest price increases were plumbing fixtures and fittings and builders hardware. The price index declined for glass, gypsum products, and prepared asphalt roofing.

INTERNATIONAL COMPETITIVENESS

Exports of U.S. non-lumber building materials rose in 1990 for the fourth consecutive year. Imports also increased, but at a slower rate, thus reducing the U.S. trade deficit in these products. Exports were up about 16 percent over 1989 and imports rose about 5 percent. Imports of non-lumber building materials came to about $4.2 billion and exports to $2.8 billion, producing a $1.4 billion deficit, down from about $1.6 billion in 1989. The peak trade deficit in these products was about $2.1 billion in both 1987 and 1986. In contrast, non-lumber building materials enjoyed sizable trade surpluses in the early 1980s, including a $774 million surplus in 1981. It should be noted, however, that the change to the Harmonized System of import and export classifications may slightly distort comparisons of trade data before 1989.

Several factors suggest a continuing improvement in the trade balance for these products. The U.S. construction market has grown little since 1986, making it a less appealing target for foreign producers. Meanwhile, increasing construction activity in many countries is boosting worldwide demand for building materials. As a result, opportunities for exports of U.S. products should grow. At the same time, foreign producers will tend to concentrate on their own markets. The U.S. Canada Free Trade Agreement should help to boost sales of U.S. construction materials, as should bilateral trade negotiations with such countries as Mexico, Japan, and Korea. Huge housing programs in countries such as Israel, Korea, Japan, and potentially in Eastern Europe will also be favorable for U.S. building materials and housing systems. The European Community, which is clearing away internal customs and other trade barriers, could also open a sizable new market for U.S. firms. Scheduled for 1992, the merger of 12 West European countries will create a single market of 325 million people. In 1988, the member nations had a Gross Domestic Product of $4.5 trillion and a per capita income of $13,770. The EC member countries are already gearing up for competition with other world markets.

The United States exports large volumes of flat glass, mineral wool, builders hardware, fabricated structural metals, hard surfaced floor coverings, prefabricated wood and metal buildings, plastics building materials, and cast iron pipe and fittings. Major imports include flat glass, cement, ceramic wall and floor tile, dimension stone (marble and granite), builders hardware, fabricated structural metals, and miscellaneous metal work products.

Canada accounts for about 40 percent of total U.S. exports of non-lumber building products. Other major customers are Mexico, Japan, the United Kingdom, Taiwan, Hong Kong, and Korea.

Major suppliers of these products to the U.S. are Canada, with about a 20-percent share, followed by Italy, Mexico, Taiwan, Japan, Spain, and West Germany.

Outlook for 1991

Demand for construction materials covered in this chapter is expected to be lower than in 1990. Construction is expected to fall about 3 percent, after adjusting for inflation.

Most categories of construction activity will decline, including the residential, private nonresidential, and public works categories. Housing starts will be down about 6 percent, with single-family units down 5 percent and multifamily units dropping 10 percent. In private nonresidential construction, only industrial building construction, public education, and electric utilities are expected to rise, by 2 percent, 5 percent, and 5 percent, respectively. Office building, hotel, and other commercial building construction will experience major declines. Total public construction will decline about 1 percent. The alterations, additions and repairs sector is expected to rise, but at a slower rate of only 3 percent in 1991.

Long-Term Prospects

Despite the slowdown in the early 1990s, the demand for construction materials should rise at a modest 2 to 3 percent annually in the 1990s. The private nonresidential building sector should experience a turnaround as the excess space built in the 1980s becomes filled.

Housing starts should rebound, but the average annual number of units started is expected to be lower than in the previous decade. At the same time, there may be a growing shift to more modest and less expensive housing, in large part because of a trend toward smaller households.

Table 1: Construction Materials Price Trends, 1984–90

(annual percent change)

Product	1984–85	1985–86	1986–87	1987–88	1988–89	1989–90[1]
Builders' hardware	3.8	2.1	1.4	4.7	4.3	4.1
Ceramic tile	5.2	5.0	3.4	3.3	2.3	1.9
Clay brick	n.a.	3.7	2.9	2.5	1.2	2.5
Concrete products	3.4	1.6	0.2	.5	1.1	1.9
Fabricated structural steel for buildings	3.0	0.6	3.6	6.4	3.6	0.2
Gypsum products	−2.3	3.6	−8.6	−9.8	−2.6	−3.0
Hard surfaced floor coverings	4.2	2.6	2.4	5.5	6.0	2.4
Insulation materials	1.1	0.5	−0.7	0.8	0.9	1.0
Metal doors, sash and trim	0.7	1.5	−0.1	9.3	6.2	1.2
Plumbing fixtures and fittings	3.0	3.2	3.6	7.3	7.0	4.0
Portland cement	2.0	−1.6	−1.9	0.1	−0.7	1.4
Prefab metal buildings	2.9	0.6	2.0	5.6	4.5	2.0
Prepared asphalt roofing	2.8	−3.7	5.1	2.6	1.3	−0.3
Sand, gravel, crushed stone	4.4	3.8	3.4	2.1	1.8	2.6
Sheet, plate and float glass	−2.0	4.5	4.0	4.2	−2.2	−4.6
All construction materials[2]	1.1	−0.3	2.1	5.7	3.3	0.5

[1] 1990 estimate.

[2] Includes lumber, wood products, and other construction products not covered in this chapter.

SOURCE: Department of Labor, Bureau of Labor Statistics; U.S. Department of Commerce, International Trade Administration.

U.S. Exports and Imports
Construction Materials
(in millions of dollars except as noted)

SIC	Industry	1989	1990[1]	1991[2]	Percent Change 1989-90	Percent Change 1990-91
3088	Plastics plumbing fixtures					
	Value of exports	20.3	20.6	20.8	1.5	1.0
	Value of imports	27.5	28.1	28.1	2.2	0.0
3211	Flat glass					
	Value of exports	497	510	500	2.6	−2.0
	Value of imports	428	500	480	16.8	−4.0
3241	Cement, hydraulic					
	Value of exports	25.4	27.0	28.5	6.3	5.6
	Value of imports	492	460	450	−6.5	−2.2
3251	Brick and structural clay tile					
	Value of exports	8.3	8.5	8.8	2.4	3.5
	Value of imports	6.3	5.8	5.5	−7.9	−5.2
3253	Ceramic wall and floor tile					
	Value of exports	17.9	19.3	20.4	7.8	5.7
	Value of imports	431	445	430	3.2	−3.4
3261	Vitreous plumbing fixtures					
	Value of exports	41.1	41.5	41.5	1.0	0.0
	Value of imports	72.6	73.5	74.0	1.2	0.7
3271	Concrete block and brick					
	Value of exports	4.6	3.9	4.1	−15.2	5.1
	Value of imports	2.2	2.4	2.4	9.1	0.0
3272	Concrete products, nec					
	Value of exports	23.6	24.5	24.0	3.8	−2.0
	Value of imports	77.0	71.5	68.0	−7.1	−4.9
3273	Ready-mixed concrete					
	Value of exports	0.0	0.0	0.0	—	—
	Value of imports	0.0	0.0	0.0	—	—
3275	Gypsum products					
	Value of exports	51.5	54.5	56.0	5.8	2.8
	Value of imports	32.2	30.5	29.0	−5.3	−4.9
3296	Mineral wool					
	Value of exports	86.0	85.5	86.0	−0.6	0.6
	Value of imports	26.8	26.7	26.5	−0.4	−0.7
3431	Metal sanitary ware					
	Value of exports	43.1	42.8	43.0	−0.7	0.5
	Value of imports	60.0	60.1	60.2	0.2	0.2
3432	Plumbing fixture fittings and trim					
	Value of exports	29.5	47.7	48.0	61.7	0.6
	Value of imports	150	175	176	16.7	0.6
3441	Fabricated structural metal					
	Value of exports	53.8	180	190	234.6	5.6
	Value of imports	14.7	190	195	1192.5	2.6
3448	Prefabricated metal buildings					
	Value of exports	71.1	87.0	80.0	22.4	−8.0
	Value of imports	25.2	20.0	25.0	−20.6	25.0
	Construct. Materials					
	Value of exports	973	1,153	1,151	18.5	−0.2
	Value of imports	1,845	2,089	2,050	13.2	−1.9

[1] Estimate [2] Forecast

SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA). Estimates and forecasts by ITA.

Huge expenditures will be required to repair—and add to—the nation's infrastructure. But budget constraints at the Federal, state, and local level are a limiting factor. As a result, privatization of previous public works could increase.

Rising requirements for electric power and communications facilities will increase demand for utility construction. The financing of costly power construction will be the key to the level of activity.

Long-term prospects for construction materials depend on several factors. During most of the 1980s, foreign demand was weak. The outlook is improving, however, thanks to stronger foreign demand, continued progress in trade negotiations, favorable exchange rates, and more aggressive efforts to increase overseas sales.

U.S. Trade Patterns in 1989
Construction Materials
SIC 3088, 321, 324, 3251, 3253, 3261, 3271, 3272, 3273, 3275, 3296, 3431, 3432, 3441, 3448
(in millions of dollars, percent)

Exports	Value	Share	Imports	Value	Share
Canada & Mexico	453	46.5	Canada & Mexico	769	41.7
South America	26.2	2.7	South America	118	6.4
European Community	79.1	8.1	European Community	268	14.5
East Asia NICs	138	14.2	East Asia NICs	171	9.3
Japan	72.6	7.5	Japan	181	9.8
Other	204	21.0	Other	339	18.4
World Total	973	100.0	World Total	1,846	100.0

Top Five Countries

	Value	Share		Value	Share
Canada	404	41.5	Canada	460	24.9
Japan	72.6	7.5	Mexico	309	16.8
Mexico	49.0	5.0	Italy	230	12.4
Hong Kong	44.5	4.6	Japan	181	9.8
United Kingdom	44.2	4.5	Spain	106	5.7

See "How to Get the Most Out of This Book" for definitions of the Country Groupings.

SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA).

Competitiveness, along with domestic and world demand, will be the key factors influencing U.S. construction material firms in the 1990s. Imports have become a regular part of U.S. supply, and growing foreign investment in the U.S. will further change the domestic industry. A stronger export effort and improving foreign markets should provide domestic producers with competitive strength and a market hedge in periods of domestic demand downturns.—*C. B. Pitcher, Office of Forest Products and Domestic Construction, (202) 377-0132, September 1990.*

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(Call the Bureau of the Census at 301-763-4100 for information about how to order Census documents.)

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Producer Prices and Price Indexes, Bureau of Labor Statistics, U.S. Department of Labor, Washington, DC 20210. Telephone: (202) 272-5113.

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FABRICATED STRUCTURAL METAL

Construction markets consume approximately 95 percent of the output of the fabricated structural metal industry, with commercial and industrial buildings accounting for 62 to 65 percent. Other important construction markets are public buildings (sports arenas, churches, and the like), hospitals, bridges and tunnels, utility company facilities, high-rise apartment buildings, and oil drilling rigs.

Shipments by the fabricated structural metal industry (SIC 3441) decreased about 1 percent in constant dollars in 1990. Despite some growth, largely in new construction of industrial buildings, the increase was more than offset by declines in the markets for office buildings and other commercial structures.

Prices stayed almost level in 1990, as they did also in 1989, reflecting the downtown in new construction of office and other commercial buildings.

Trends and Forecasts: Fabricated Structural Metal (SIC 3441)

(in millions of dollars except as noted)

Item	1987	1988[1]	1989[2]	1990[2]	1991[3]	Percent Change			
						1987-88	1988-89	1989-90	1990-91
Industry Data									
Value of shipments[4]	8,667	9,026	9,013	8,630	—	4.1	−0.1	−4.2	—
Value of shipments (1987$)	8,667	8,571	8,700	8,613	8,182	−1.1	1.5	−1.0	−5.0
Total employment (000)	80.9	80.3	83.0	82.0	—	−0.7	3.4	−1.2	—
Production workers (000)	57.8	58.0	59.2	58.8	—	0.3	2.1	−0.7	—
Average hourly earnings ($)	9.92	10.20	10.50	10.80	—	2.8	2.9	2.9	—
Capital expenditures	131	174	—	—	—	32.8	—	—	—
Product Data									
Value of shipments[5]	7,732	7,992	7,964	7,625	—	3.4	−0.4	−4.2	—
Value of shipments (1987$)	7,732	7,573	7,687	7,610	7,230	−2.1	1.5	−1.0	−5.0

[1] Advance data from the 1988 Annual Survey of Manufactures.

[2] Estimate.

[3] Forecast.

[4] Value of all products and services sold by establishments in the fabricated structural metal industry.

[5] Value of products classified in the fabricated structural metal industry produced by all industries.

SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA). Estimates and forecasts by ITA.

INTERNATIONAL COMPETITIVENESS

U.S. imports of fabricated structural metal have dropped steadily since 1986. From a high of $457 million that year, imports fell to $336 million in 1987, and to $307 million in 1988. Imports in 1989 were at an even lower level: $219 million. Movements in international monetary exchange rates are partly responsible, but developments in the Canadian fabricated structural metal industry have played a greater role. One of Canada's major exporters to the United States left the business altogether, another cut its production capacity in half, and a third set up two production facilities in the United States.

After declining for several years, exports of these products have begun to increase substantially. Following a 53 percent rise from 1987 to 1988, exports rose almost fivefold, to $213 million in 1989, nearly equaling the value of imports for the first time in decades. Exchange rates undoubtedly are playing a major role by making U.S. fabricated structural metal much more competitive on the world market.

Outlook for 1991

Construction of industrial buildings will increase modestly, but lower construction of office buildings, hotels, and other commercial structures will more than make up for the rise. As a result, shipments of fabricated structural metal are likely to drop by at least 5 percent.

Long-Term Prospects

Production of fabricated structural metal will decline for the foreseeable future, reflecting the chronic low level of new construction of office buildings, multifamily housing, and highway bridges. Not before these markets improve, probably in the mid-1990s, will shipments start to grow.—*Franklin E. Williams, Office of Forest Products and Domestic Construction, (202) 377-0132, September 1990.*

Additional References

(Call the Bureau of the Census at 301-763-4100 for information about how to order Census documents.)

AISC Marketing Bulletin, American Institute of Steel Construction, Inc., Wrigley Building, 400 North Michigan Avenue, Chicago, IL 60611. Telephone: (312) 670-2400.

Iron Age, Chilton Publishing Company, Chilton Way, Radnor, PA 19089. Telephone: (215) 964-4000.

The Ironworker, International Association of Bridge, Structural and Ornamental Ironworkers, 1750 New York Avenue, Washington, DC 20006. Telephone: (202) 383-4878.

1987 Census of Manufactures (MC87-1-34C), Bureau of the Census, U.S. Department of Commerce, Washington, DC 20233.

CEMENT

Consumption of hydraulic cement (SIC 3241) decreased about 1 percent by volume in 1990, to 89.8 million tons. Domestic shipments were up about 2 percent, while imports declined about 15 percent. Portland cement accounts for about 90 percent of the hydraulic cement industry. Masonry, lime, and natural cements make up the rest.

Demand for cement closely tracks both total construction and the mix of construction. Most cement is used in nonresidential construction. Data collected by the Portland Cement Association show that about 64 percent is used for buildings, of which 30 percent are residential, 7 percent public, 22 percent commercial, and 5 percent farm. Public works consumed about 31 percent, of which streets and highways make up 19 percent, water and waste systems 8 percent, and other 4 percent. Other applications, such as oil wells, burial vaults, take up the rest.

U.S. cement capacity has declined over the last several years despite forecasts for demand growth in the 1990s. In 1989, clinker capacity was 83.2 million short tons and finished capacity about 98.1 million tons. By comparison, clinker capacity in 1984 was 90.3 million tons and finished was 103.6 million tons. Although some capacity additions are under way, they could be offset by additional plant and kiln closings over the next two to three years. Some of the closed facilities have become import terminals.

Capacity utilization has been increasing, however. According to the Bureau of Mines, capacity utilization increased from 1982 to 1986, declined slightly in 1987, and rose again in 1988 and 1989. Clinker capacity utilized rose from 68 percent in 1982 to about 83 percent in 1989. Finished capacity utilization rose from 59 percent to about 75 percent.

INTERNATIONAL COMPETITIVENESS

Cement imports have become a major part of supply over the last few years (Table 2). In addition to using closed plants as import terminals, many import terminals have

Table 2: U.S. Hydraulic Cement Shipments, Imports, Exports, Consumption, and Imports as Percent of Consumption, 1977–90

(thousand short tons)

Year	Shipments[1 2 3]	Imports[4]	Exports	Consumption[5]	Imports as percent of consumption
1977	77,784	3,989	236	81,537	4.9
1978	81,097	6,577	55	87,619	7.5
1979	78,555	9,393	149	87,799	10.7
1980	72,541	5,244	186	77,599	6.8
1981	69,658	3,963	300	73,321	5.4
1982	62,913	2,911	201	65,623	4.4
1983	69,332	4,221	118	73,435	5.7
1984	75,704	8,689	80	84,313	10.3
1985	73,434	14,120	98	87,456	16.1
1986	75,432	16,128	59	91,501	17.6
1987	76,402	17,536	52	93,886	18.7
1988	75,991	17,366	101	93,256	18.6
1989	75,569	15,619	512	90,676	17.2
1990[6]	77,080	13,275	525	89,830	14.8

[1] Adjusted to eliminate duplication of imported clinker and cement shipped by domestic cement manufacturers.

[2] Includes Portland and masonry cement only.

[3] Data exclude shipments from plants in Puerto Rico.

[4] Excludes imports to Puerto Rico and the Virgin Islands.

[5] U.S. shipments, plus imports, less exports.

[6] Estimate.

SOURCE: U.S. Department of Interior, Bureau of Mines; U.S. Department of Commerce, Bureau of the Census and International Trade Administration.

been built and floating terminals opened. Imports peaked in 1987 at about 17.5 million short tons, declined slightly in 1988 to 17.4 million tons, and declined at a faster rate in 1989 and 1990 to 15.6 and 13.2 million tons, respectively. The decline in imports reflects stronger world demand, little, if any, growth in U.S. demand, and dumping investigations of Mexican and Japanese cement. The threat of additional investigations is also a factor in declining imports.

Historically, Canada was the largest supplier of cement to the United States. Starting in 1986, however, Mexico became the primary source. In 1989, Mexico supplied 28 percent of total U.S. imports, Canada 22 percent, Japan 15 percent, Spain 10 percent, Greece 9 percent, and Japan 10 percent. Other major supplying countries included France, Korea, Venezuela, and Colombia.

In recent years, about 70 percent of all imported cement has been brought in by firms that also produce cement in this country. This enables the firms to supplement their supplies with cement that is often cheaper and thereby compete more efficiently with other importing producers and independent importers. The remaining 30 percent of foreign cement is brought in by independent importers. Some of these firms are owned or partially owned by foreign producers, and some by U.S. ready-mix concrete firms.

Over the past decade, imports of cement were spurred by weakness in world demand and a resulting overcapacity in most countries. At the same time, the U.S. market was strong, and a surplus of water transport carriers lowered transportation cost. Exchange rates often made imports cheaper and the internationalization of the U.S. cement industry eased the way for imports. Many of the foreign owners operating in the U.S. are world traders and can easily import rather than produce when the economic situation warrants.

Almost 70 percent of U.S. clinker capacity was foreign-owned in 1990. Of the 10 largest U.S. producing firms, all but three were foreign-owned and a Japanese firm has an option to purchase one of those. Furthermore, the industry is undergoing structural changes. Many firms, both U.S. and foreign-owned, have been vertically expanding into the concrete and aggregate business. Acquisitions of companies and plants have become frequent and more are likely. Both U.S. and foreign producers are more frequently turning to joint ventures to manufacture domestically and to import. Several foreign firms that purchased U.S. cement facilities over the last several years have been repositioning themselves in regional markets by buying and selling plants and distribution facilities.

In late 1989, a dumping complaint was made against Mexico. Subsequently, the International Trade Commission determined that the U.S. industry was injured by the Mexican imports and imposed dumping margins of between 52 and 58 percent against most Mexican producers. The effect on the industry and on cement prices in particular is yet to be determined. Another dumping petition was filed in 1990 against imports from Japan, and related dumping and injury investigations are under way. Having succeeded in the Mexican case, the domestic industry may initiate additional investigations.

The Producer Price Index for Portland cement rose by 1.4 percent in 1990 after declining 0.7 percent in 1989. Overall, prices have been relatively flat since 1983, when the index rose about 4 percent. Because of the local character of cement markets, however, prices were up in some areas and down in others. Competition from low-priced imports has been a major factor in pricing, and market share considerations among all suppliers also contributed to pricing strategies.

Trends and Forecasts: Cement, Hydraulic (SIC 3241)

(in millions of dollars except as noted)

Item	1987	1988[1]	1989[2]	1990[2]	1991[3]	Percent Change 1987–88	1988–89	1989–90	1990–91
Industry Data									
Value of shipments[4]	4,322	4,234	4,179	4,321	—	−2.0	−1.3	3.4	—
Value of shipments (1987$)	4,322	4,222	4,197	4,287	4,148	−2.3	−0.6	2.0	−3.1
Total employment (000)	19.2	18.6	18.2	18.2	—	−3.1	−2.2	0.0	—
Production workers (000)	14.5	14.2	13.9	13.9	—	−2.1	−2.1	0.0	—
Average hourly earnings ($)	14.08	13.97	14.13	14.22	—	−0.8	1.1	0.6	—
Capital expenditures	167	193	—	—	—	15.6	—	—	—
Product Data									
Value of shipments[5]	4,116	4,023	3,971	4,106	—	−2.3	−3.7	3.4	—
Value of shipments (1987$)	4,116	4,011	3,987	4,067	3,941	−2.6	−0.6	2.0	−3.1

[1] Advance data from the 1988 Annual Survey of Manufactures.

[2] Estimate.

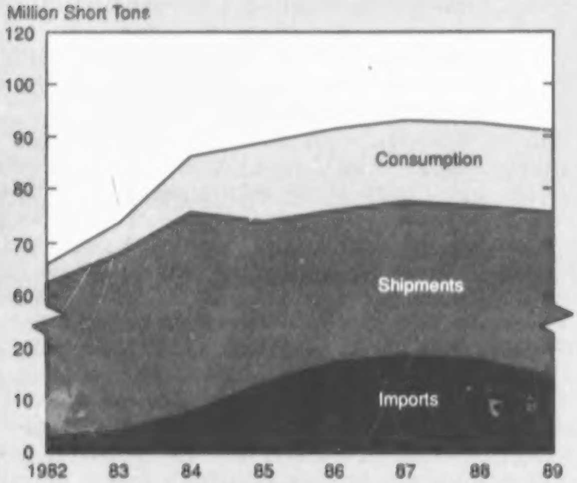
[3] Forecast.

[4] Value of all products and services sold by establishments in the cement, hydraulic industry.

[5] Value of products classified in the cement, hydraulic industry produced by all industries.

SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA). Estimates and forecasts by ITA.

Figure 7-1
Portland Cement
U.S. Shipments, Imports, and Consumption



Source: U.S. Department of Interior, Bureau of Mines; U.S. Department of Commerce, Bureau of the Census.

Outlook for 1991

Cement consumption should decline 3.1 percent in response to the expected downturn in construction. Both domestic shipments and import volume will drop. Domestic shipments will be down about 2 percent, and imports about 6 percent. The import-to-consumption ratio should decline to about 14 percent.

Long-Term Prospects

After the slowdown in cement demand in the early 1990s, demand is expected to rise again. Expectations are for record levels of cement requirements in the next decade, driven by the need for new construction, and renovation and repair work. The U.S. infrastructure issue is tied to national domestic and international competitiveness.

Cement imports over the last few years have helped U.S. contractors by providing adequate supplies at low prices during a period of high demand. Over the longer term, adequacy of supply and prices will be the key issues. Without considerable capacity additions, which are not now under way, the domestic market will likely become more dependent on foreign cement. If that happens, prices will be determined increasingly by foreign suppliers. Still unknown is whether the results of dumping cases will lead U.S. producers to increase domestic capacity.—*C.B. Pitcher, Office of Forest Products and Domestic Construction, (202) 377-0132, September 1990.*

Additional References

(Call the Bureau of the Census at 301-763-4100 for information about how to order Census documents.)

Mineral Industry Survey, Cement; and *Mineral Yearbook: Cement*, U.S. Department of the Interior, Washington, DC 20240. Telephone: (202) 634-1184.

Competitive Assessment of the U.S. Cement Industry, International Trade Administration, U. S. Department of Commerce, Washington, DC 20230. (202) 377-0132.

Portland Cement Consumption and *U.S. and Canadian Portland Cement Industry:Plant Information Summary*, Portland Cement Association, 5420 Old Orchard Road, Skokie, Illinois 60077.(708) 966-6200.

The North American Cement Review, Douglas M Queen, Inc. 2143 Old Spring Road, Williamstown, Massachusetts 01267. Telephone: (413) 458-8364.

Pit & Quarry, Edgell Communications, Inc. Cleveland, Ohio 44130

Rock Products, Maclean Hunter Publishing Co., Chicago, Illinois 60606. Telephone: (312) 726-2805.

CONCRETE PRODUCTS

This section covers concrete block and brick (SIC 3271), concrete products, not elsewhere classified (n.e.c.) (SIC 3272), and ready mix concrete (SIC 3273). Ready mix concrete shipments in 1990 were slightly below those in 1989, dropping 1.2 percent. Reflecting the general decline in construction, shipments of concrete block and brick were down about 1.8 percent, and other concrete products declined 2.1 percent.

Ready mixed concrete is the largest of these industries with about 5,400 operations in the U.S. The industry supplies most of the concrete used domesticallly. About 74

Trends and Forecasts: Concrete Block and Brick (SIC 3271)

(in millions of dollars except as noted)

Item	1987	1988[1]	1989[2]	1990[2]	1991[3]	Percent Change 1987-88	1988-89	1989-90	1990-91
Industry Data									
Value of shipments[4]	2,246	2,339	2,448	2,445	—	4.1	4.7	−0.1	—
Value of shipments (1987$)	2,246	2,310	2,381	2,340	2,259	2.8	3.1	−1.7	−3.5
Total employment (000)	18.6	18.3	18.5	18.4	—	−1.6	1.1	−0.5	—
Production workers (000)	10.8	10.4	10.6	10.5	—	−3.7	1.9	−0.9	—
Average hourly earnings ($)	9.20	9.71	10.10	10.55	—	5.5	4.0	4.5	—
Capital expenditures	72.0	39.5	—	—	—	−45.1	—	—	—
Product Data									
Value of shipments[5]	1,951	2,123	2,222	2,218	—	8.8	4.7	−0.1	—
Value of shipments (1987$)	1,951	2,090	2,155	2,117	2,044	7.1	3.1	−1.8	−3.4

[1] Advance data from the 1988 Annual Survey of Manufactures.
[2] Estimate.
[3] Forecast.
[4] Value of all products and services sold by establishments in the concrete block and brick industry.
[5] Value of products classified in the concrete block and brick industry produced by all industries.

SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA). Estimates and forecasts by ITA.

Trends and Forecasts: Concrete Products, NEC (SIC 3272)

(in millions of dollars except as noted)

Item	1987	1988[1]	1989[2]	1990[2]	1991[3]	Percent Change 1987-88	1988-89	1989-90	1990-91
Industry Data									
Value of shipments[4]	5,828	6,144	6,280	6,259	—	5.4	2.2	−0.3	—
Value of shipments (1987$)	5,828	6,104	6,206	6,077	5,853	4.7	1.7	−2.1	−3.7
Total employment (000)	70.0	71.5	72.0	71.6	—	2.1	0.7	−0.6	—
Production workers (000)	53.1	53.4	54.0	53.5	—	0.6	1.1	−0.9	—
Average hourly earnings ($)	8.81	9.12	9.31	9.48	—	3.5	2.1	1.8	—
Capital expenditures	194	125	—	—	—	−35.6	—	—	—
Product Data									
Value of shipments[5]	5,512	5,826	5,955	5,935	—	5.7	2.2	−0.3	—
Value of shipments (1987$)	5,512	5,817	5,908	5,785	5,578	5.5	1.6	−2.1	−3.6

[1] Advance data from the 1988 Annual Survey of Manufactures.

[2] Estimate.

[3] Forecast.

[4] Value of all products and services sold by establishments in the concrete products, nec industry.

[5] Value of products classified in the concrete products, nec industry produced by all industries.

SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA). Estimates and forecasts by ITA.

percent of cement sales are to ready mix firms, which mix and deliver the concrete to construction sites. Some construction contractors purchase and mix concrete themselves, but they account for only about 10 percent of cement sales. Demand for ready mix concrete is local, with shipments usually less than 50 miles from plants. Most ready mix goes to the nonresidential construction sector.

The concrete block and brick industry produces a wide range of standard and lightweight concrete blocks, pavers, and architectural shapes. Commercial buildings are usually the largest market, followed by residential, institutional, and industrial buildings. This industry, combined with the concrete products (n.e.c.) industry, usually purchases about 11 percent of total cement shipped. More than 1,100 concrete block and brick plants in the U.S. serve markets, usually within a 100-mile radius of the plant.

The concrete products n.e.c. industry manufactures concrete pipe and various precast and prestressed products, including railway crossties, structural building elements, cladding panels, light poles, slabs, manholes, roof tiles, septic tanks, columns, girders, and fence posts. Dry concrete mixes are also included in this industry. More than 3,100 plants serve markets in the U.S., usually less than 100 miles from the plant. Concrete pressure pipe and a few prestressed and precast products are sometimes shipped longer distances. Of these three major segments of the industry, precast accounted for shipments worth about $2.7 billion, followed by pipe with $1.65 billion, and prestressed with $1.4 billion.

Prices for concrete products have risen modestly in recent years, with the Producer Price Index rising 0.2 percent in 1987, 0.5 percent in 1988, 1.1 percent in 1989, and 1.9 percent in 1990. The price rises reflect increasing demand and higher costs for cement, admixtures, sand, gravel, crushed stone, and lightweight aggregates, rebars, steel mesh, prestressed steel strand, and metal and nonmetal reinforcing fibers.

Most of the firms are small to medium-sized. However, a large number have become part of the cement-concrete-aggregate conglomerates. Several are now owned by foreign firms that are also established in the cement and aggregates sectors. Foreign trade in these materials is small, largely because they are heavy and bulky. Usually they are shipped only short distances from the plants. Most trade flows across the Mexican and Canadian borders.

Outlook for 1991

With construction activity expected to decline, lower shipments are in store for the three concrete industries. The concrete block industry should experience a drop of about a 3.4 percent, the ready mix industry about 3.0 percent, and the concrete products n.e.c. industry is expected to drop about 3.6 percent.

Long-Term Prospects

Longer term the concrete industries should experience about a 3 percent growth as the pace of construction picks

Trends and Forecasts: Ready-Mixed Concrete (SIC 3273)

(in millions of dollars except as noted)

Item	1987	1988[1]	1989[2]	1990[2]	1991[3]	Percent Change 1987-88	1988-89	1989-90	1990-91
Industry Data									
Value of shipments[4]	12,975	12,884	12,729	12,856	—	−0.7	−1.2	1.0	—
Value of shipments (1987$)	12,975	12,825	12,466	12,316	11,947	−1.2	−2.8	−1.2	−3.0
Total employment (000)	96.9	93.2	92.6	92.0	—	−3.8	−0.6	−0.6	—
Production workers (000)	73.9	68.8	67.5	67.0	—	−6.9	−1.9	−0.7	—
Average hourly earnings ($)	10.59	11.92	11.12	11.34	—	12.6	−6.7	2.0	—
Capital expenditures	479	338	—	—	—	−29.4	—	—	—
Product Data									
Value of shipments[5]	11,795	11,834	11,692	11,809	—	0.3	−1.2	1.0	—
Value of shipments (1987$)	11,795	11,779	11,449	11,312	10,973	−8.1	−2.8	−1.2	−3.0

[1] Advance data from the 1988 Annual Survey of Manufactures.

[2] Estimate.

[3] Forecast.

[4] Value of all products and services sold by establishments in the ready-mixed concrete industry.

[5] Value of products classified in the ready-mixed concrete industry produced by all industries.

SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA). Estimates and forecasts by ITA.

up from the low levels of the early 1990s. New infrastructure construction and needed repairs of existing roads and bridges will increase demand. In addition, the flexibility of concrete design, new concrete on-site and prefab technology, and the apparent growing popularity of masonry construction also will spur new business.—*C.B. Pitcher, Office of Forest Products and Domestic Construction, (202) 377-0132, September 1990.*

Additional References

Concrete, Edgell Communications, Inc., 7500 Old Oak Blvd., Cleveland, Ohio, 44130. Telephone: (216) 243-8100.

Concrete Products, Maclean-Hunter Publishing Co., 300 W. Adams St., Chicago, Il 60606. Telephone: (312) 726-2802.

PREFABRICATED METAL BUILDINGS

Producers of metal buildings are continuing to increase their share of the market for low-rise nonresidential buildings. According to the Metal Building Manufacturers Association (MBMA), the industry had 57 percent of the market for structures up to 150,000 square feet in 1989, up substantially from 47 percent a decade ago.

After staying virtually the same in 1987 and 1988, shipments of prefab metal buildings rose approximately 5 percent in 1989. In 1990 shipments were expected to have leveled off at slightly above those in 1989.

The industry sells one- and two-story office buildings, "industrial" buildings (manufacturing plants and warehouses), and such low-rise structures as fast-food restaurants, auto showrooms, retail stores, skating rinks, and other sports facilities. According to the MBMA, which represents most of the major producers, commercial buildings commanded 40 percent of its members' sales in 1989, manufacturing structures accounted for 35 percent, and community buildings made up another 9 percent. A "miscellaneous" category that includes agricultural buildings made up the remaining 16 percent.

After five years of declining sales overseas, exports of metal buildings increased by 34 percent in 1988, to $84 million, before falling to $71 million in 1989. In 1990, however, exports rose to about $87 million, largely in response to favorable exchange rates.

Seitz Seabolt and Associates, Inc.

Prefabricated metal buildings are expected to gain a larger share of the market for industrial and commercial buildings in the 1990s.

Outlook for 1991

A sharp decline for most of the nonresidential building construction sectors in 1991 will mean that shipments of prefabricated metal buildings will decrease by at least 4 percent.

Long-Term Outlook

Although the office building market will continue to decline, construction of industrial buildings is expected to be moderately strong, increasing 2 to 4 percent annually. The "other commercial buildings" sector, while decreasing 10 percent in 1991, is expected to regain a moderately high level of activity by the mid-1990s. Consequently, the prefabricated metal building industry should have good years in the middle of the decade, since industrial and other commercial buildings constitute two of its major markets. In addition, it is reasonable to expect manufacturers of metal buildings to continue to acquire larger market shares.—*Franklin E. Williams, Office of Forest Products and Domestic Construction, (202) 377-0132, September 1990.*

Additional References

(Call the Bureau of the Census at 301-763-4100 for information about how to order Census documents.)

Trends and Forecasts: Prefabricated Metal Buildings (SIC 3448)

(in millions of dollars except as noted)

Item	1987	1988[1]	1989[2]	1990[2]	1991[3]	Percent Change 1987-88	1988-89	1989-90	1990-91
Industry Data									
Value of shipments[4]	3,147	3,269	3,432	3,380	—	3.9	5.0	−1.4	—
Value of shipments (1987$)	3,147	3,121	3,277	3,310	3,178	−1.0	5.0	1.0	−4.0
Total employment (000)	26.4	26.1	29.0	30.0	—	−1.1	11.1	3.4	—
Production workers (000)	17.6	17.7	19.4	20.0	—	0.6	9.6	3.1	—
Average hourly earnings ($)	9.06	9.20	9.35	9.50	—	1.5	1.6	1.6	—
Capital expenditures	50.8	55.6	—	—	—	9.4	—	—	—
Product Data									
Value of shipments[5]	2,825	2,881	3,025	2,979	—	2.0	5.0	−1.5	—
Value of shipments (1987$)	2,825	2,752	2,890	2,919	2,802	−2.6	5.0	1.0	−4.0

[1] Advance data from the 1988 Annual Survey of Manufactures.

[2] Estimate.

[3] Forecast.

[4] Value of all products and services sold by establishments in the prefabricated metal buildings industry.

[5] Value of products classified in the prefabricated metal buildings industry produced by all industries.

SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA). Estimates and forecasts by ITA.

best copy available

1987 Census of Manufactures (MC87-1-34C), Bureau of the Census U.S. Department of Commerce, Washington, DC 20233.

Metal Building Manufacturers Association, 1230 Keith Building, Cleveland, OH 44115. Telephone: (216) 241-7333.

Metal Construction News, Modern Trade Communications, 7450 Skokie Boulevard, Skokie, IL 60077. Telephone: (708) 674-2200.

Systems Builders Association, C. S. Long, Inc., P.O. Box 117, West Milton, OH 45383. Telephone: (513) 698-4127.

FLAT GLASS

The flat glass industry is composed of companies that make unfabricated float glass, window glass, cathedral glass, antique glass, sealed insulating glass units, opalescent flat glass, picture glass, laminated glass, motor vehicle windshields and windows, skylight glass, and tempered glass.

About 57 percent of all shipments of flat glass goes to the construction industry and another 25 percent to the automotive industry. The remaining output, known as "specialty products," includes mirrors, solar panels, and advertising signs.

Shipments of unfabricated float glass began to establish record volume beginning in 1986, totaling 3.7 billion square feet. In 1987, shipments reached 4.1 billion square feet. Shipments continued to increase in 1989 and 1990, reaching 4.2 billion square feet and 4.7 billion square feet, respectively. Shipments in 1990 were estimated to have been about the same as in 1989. Overall shipments of flat glass and flat glass products should increase by 2 percent over 1989.

Prices of flat glass and flat glass products have declined over the past few years, falling 3.5 percent from 1988 to 1989 and 2.5 percent from 1989 to 1990. The trend is expected to continue as manufacturers engage in strong price competition to increase their gross sales volume and retain their share of the market.

Foreign trade is very important in the flat glass industry and exports in 1990 were maintaining their gains of the previous year. In 1989, exports rose 22 percent over 1988, totaling $506 million, compared with $416 million in 1986 and $356 million in 1987. Imports were valued at $513 million in 1988 and rose to $516 million in 1989.

Outlook for 1991

Sharply declining construction of industrial buildings and a moderate drop in domestic motor vehicle production will cause shipments of flat glass to decline about 5 percent.

Long-Term Prospects

Although the construction and motor vehicle production markets will be weaker than in recent years—and may decline further—demand for flat glass and flat glass products should continue to be fairly high in both industries.

But it will be at least the mid-1990s before the output of the flat glass industry reaches the levels of the 1986-1987 period.

The industry will continue to work on developing new products to increase sales in the construction and motor vehicle markets. Further advances are expected in two important developments: switchable glass, in which the opacity is changed by electronic and other means, and in energy-conserving low-emissivity glass. Another interesting technological advancement is radiation-shielding glass, which secures a building against electronic surveillance from outside.—*Franklin E. Williams, Office of Forest Products and Domestic Construction, (202) 377-0132, September 1990.*

Additional References

(Call the Bureau of the Census at (301) 763-4100 for information about how to order Census documents.)

Flat Glass, Current Industrial Reports, Series MQ32A Glass Products, SIC 32, 1987 Census of Manufactures, Series MC87(2)-32A, Bureau of the Census, U.S. Department of Commerce, Washington, DC 20233.

Glass Digest, Ashlee Publishing Company, 110 East 42nd Street, New York, NY 10017. Telephone: (212) 682-7681.

Glass Magazine, National Glass Association, 8200 Greensboro Drive, McLean, VA 22102. Telephone: (703) 442-4890.

BRICK

Despite lower housing starts, shipments of the brick and structural clay tile industry (SIC 3251) remained about even in 1990. The industry was boosted by a strong remodeling market, new brick applications, an improved market for pavers, and a growing popularity of masonry cladding in nonresidential building.

Brick demand is sensitive to new residential construction and to other types of building construction. The mix of residential construction (single and multifamily) also influences demand, with the biggest effect coming from single-family construction. The use of brick as a siding material in single-family houses has been declining. In 1989, bricks held a 17 percent share of the new single-family market nationally, compared with 26 percent in 1984. Wood and wood products held the largest share of this market in 1989

Trends and Forecasts: Flat Glass (SIC 3211)

(in millions of dollars except as noted)

Item	1987	1988[1]	1989[2]	1990[2]	1991[3]	Percent Change 1987-88	1988-89	1989-90	1990-91
Industry Data									
Value of shipments[4]	2,549	2,442	2,404	2,392	—	−4.2	−1.6	−2.7	—
Value of shipments (1987$)	2,549	2,410	2,458	2,507	2,382	−5.5	2.0	2.0	−5.0
Total employment (000)	14.6	13.8	13.4	13.0	—	−5.5	−2.9	−3.0	—
Production workers (000)	11.8	11.2	10.8	10.5	—	−5.1	−3.6	−2.8	—
Average hourly earnings ($)	15.97	16.18	16.35	16.50	—	1.3	1.1	0.9	—
Capital expenditures	151	151	—	—	—	0.0	—	—	—
Product Data									
Value of shipments[5]	2,426	2,349	2,312	2,300	—	−3.2	−1.6	−2.7	—
Value of shipments (1987$)	2,426	2,318	2,364	2,411	2,290	−4.5	2.0	−0.3	−5.0

[1] Advance data from the 1988 Annual Survey of Manufactures.

[2] Estimate.

[3] Forecast.

[4] Value of all products and services sold by establishments in the flat glass industry.

[5] Value of products classified in the flat glass industry produced by all industries.

SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA). Estimates and forecasts by ITA.

Facing slower growth, the brick industry is developing new colors, shapes, and labor-saving installation methods.

with 39 percent, stucco had a 19 percent share, aluminum siding 6 percent, and the other category (mostly vinyl) had 18 percent. The residential siding market for brick varies among regions, however. It has a 30 percent share in the South, 16 percent in the Midwest, 5 percent in the Northeast, and only 2 percent in the West.

Most brick producers are small firms that distribute their products regionally. About 160 firms operate 260 plants. An estimated 35 to 40 percent of the industry capacity is foreign owned.

The Producer Price Index for clay brick rose about 2.5 percent in 1990 after a 1.2 percent increase in 1989. Brick prices respond mainly to demand and to competition from within the industry and from other products used for the same applications.

Foreign trade in clay brick is small. U.S. imports have come from neighboring Canada and Mexico, while most U.S. exports are to Canada.

Outlook for 1991

Shipments of clay brick in 1991 should decline about 4.0 percent in 1991, reflecting the expected decline in new construction new nonresidential buildings. No major changes in the level of U.S. trade are expected.

Long-Term Prospects

The brick industry should experience slow growth over the longer term, rising only about 1 to 2 percent annually. The cyclical nature of construction activity will continue to be the major determinant of demand. The industry is striving to develop and promote new markets and to compete more effectively through technology, thinner brick for cladding, new colors, labor-saving installation methods, and new shapes and sizes to enhance architectural applications.—*C.B. Pitcher, Office of Forest Products and Domestic Construction, (202) 377-0132, September 1990.*

Additional References

(Call the Bureau of the Census at (301) 763-4100 for information about how to order Census documents.)

Current Industrial Reports, Clay Construction Products, M32D, Bureau of the Census, U.S. Department of Commerce, Washington, DC 20233.

GYPSUM PRODUCTS

Shipments of gypsum products (SIC 3275) in 1990 were expected to have been about 20.8 billion square feet, slightly under the 1989 level of almost 20.9 billion. This follows seven consecutive years of growth. The industry produces various types of gypsum board and plasters (building and industrial.)

Gypsum boards make up over 90 percent of the industry's output. They are mainly in residential buildings as well as for alterations, additions, and repairs to existing buildings. Of total sales in 1990, regular board accounted for 60 percent; type X fire-resistant board for 29 percent; 5/16 inch mobile home board 3 percent; moisture-resistant board 3 percent;

Trends and Forecasts: Brick and Structural Clay Tile (SIC 3251)

(in millions of dollars except as noted)

Item	1987	1988[1]	1989[2]	1990[2]	1991[3]	Percent Change 1987-88	1988-89	1989-90	1990-91
Industry Data									
Value of shipments[4]	1,254	1,243	1,216	1,246	—	−0.9	−2.2	2.5	—
Value of shipments (1987$)	1,254	1,216	1,176	1,175	1,129	−3.0	−3.3	−0.1	−3.9
Total employment (000)	16.6	15.8	156	15.5	—	−4.8	887.3	−90.1	—
Production workers (000)	13.4	12.7	12.5	12.4	—	−5.2	−1.6	−0.8	—
Average hourly earnings ($)	8.07	8.27	8.43	8.51	—	2.5	1.9	0.9	—
Capital expenditures	56.4	65.8	—	—	—	16.7	—	—	—
Product Data									
Value of shipments[5]	1,151	1,125	1,101	1,129	—	−2.3	−2.1	2.5	—
Value of shipments (1987$)	1,151	1,097	1,062	1,062	1,019	−4.7	−3.2	0.0	−4.0

[1] Advance data from the 1988 Annual Survey of Manufactures.

[2] Estimate.

[3] Forecast.

[4] Value of all products and services sold by establishments in the brick and structural clay tile industry.

[5] Value of products classified in the brick and structural clay tile industry produced by all industries.

SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA). Estimates and forecasts by ITA.

veneer base 2 percent; and sheathing, lath and predecorated board 3 percent.

The gypsum sector of this industry is highly concentrated, with three firms, each with many plants, accounting for about 70 percent of U.S. sales.

For the fourth consecutive year the Producer Price Index for gypsum products has declined. In 1990 the index dropped 3 percent, following declines of 2.6, 9.8, and 8.6 percent the previous three years. The price declines reflect added capacity and strong competition amid slower growth of demand.

Imports of gypsum boards rose to about $100 million when some domestic market shortages developed in 1986, but have since declined to about $23 million in 1990. In addition, the United States imports crude and calcined gypsum to make wallboard and plasters. Exports of board have been increasing over the last few years. They totaled about $26 million in 1990, the highest ever, and went mainly to Canada, Mexico, and the Caribbean.

Outlook for 1991

Gypsum board sales will reflect the unfavorable outlook for new building construction, but will benefit from the continued growth in the residential and nonresidential remodeling and repair market. The net effect should be a slight decline of 2 percent, to 20.4 billion square feet.

Long-Term Prospects

Demand for gypsum boards will increase over the next several years as the new residential and nonresidential building construction markets recover from the current slowdown and as the alterations, additions, and repairs market continues to grow. New gypsum board products and applications will also support long-range growth. Growth should average about 3 percent a year for the next 5 years.—*C.B. Pitcher, Office of Forest Products and Domestic Construction, (202) 377-0132, September 1990.*

Additional References

Mineral Industry Survey: Gypsum and Minerals Yearbook: Gypsum, Bureau of Mines, U.S. Department of Interior, Washington, DC 20240. Telephone: (202) 634-1206.

CERAMIC TILE

The ceramic wall and floor tile industry (SIC 3253) enjoyed record shipments of 543 million square feet in 1989, but 1990 saw a 7 percent decline to about 507 million square feet. Nevertheless, the popularity of ceramic tile is growing.

About 100 plants manufacture ceramic tile and accessories in the United States, with markets that can be regional and/or national for some styles. Shipments often exceed 200 miles.

Table 3: Ceramic Tile Shipments, Imports, Exports, Consumption, and Percent Imports to Consumption, 1972–90

(millions of square feet)

Year	U.S. shipments	Imports	Exports	Consumption	Percent imports to consumption
1972	307.9	167.0	2.8	472.1	35.4
1973	300.6	170.1	1.5	469.2	36.3
1974	273.2	155.5	3.2	425.5	36.5
1975	251.7	91.8	2.0	341.5	26.9
1976	277.2	136.1	3.2	410.1	33.2
1977	265.0	217.8	5.5	477.3	45.6
1978	301.7	253.9	5.8	549.8	46.2
1979	312.8	291.6	6.7	597.7	48.8
1980	297.6	255.4	7.9	545.1	46.9
1981	299.8	254.7	11.2	543.3	46.9
1982	304.7	225.8	11.8	518.7	43.5
1983	348.3	297.9	10.0	636.2	46.8
1984	408.7	452.9	8.3	853.3	53.1
1985	393.5	532.7	6.1	920.1	57.9
1986	452.2	505.8	5.9	952.1	53.1
1987	478.9	523.0	6.9	995.0	52.6
1988	470.7	523.1	9.8	984.0	53.2
1989	543.3	712.1	n.a.	1256.4	56.7
1990*	507.0	780.0	n.a.	1287.0	60.6

*Estimate

INTERNATIONAL COMPETITIVENESS

Imports, by volume, accounted for about 57 percent of U.S. consumption in 1989 and about 60 percent in 1990. This was the highest import-to-consumption ratio ever (Table 3). Among ceramic tile, the ratio was highest for glazed and unglazed wall and floor tile, and somewhat lower for mosaic and quarry tiles.

In 1990, imports of ceramic tile reached an all-time high of 780 million square feet, up from 712 million in 1989. Value of imports in 1990 was almost $500 million. Italy is the largest supplier, accounting for almost half of all U.S. imports. Other major suppliers are Mexico, Spain, Japan, Brazil, Korea, and Taiwan.

U.S. exports of ceramic tile are small, but grew from $12 million in 1988 to almost $18 million in 1989 and to about $20 million in 1990.

Trends and Forecasts: Gypsum Products (SIC 3275)

(in millions of dollars except as noted)

Item	1987	1988[1]	1989[2]	1990[2]	1991[3]	Percent Change 1987–88	1988–89	1989–90	1990–91
Industry Data									
Value of shipments[4]	2,671	2,378	2,347	2,265	—	−11.0	−1.3	−3.5	—
Value of shipments (1987$)	2,671	2,598	2,634	2,621	2,569	−2.7	1.4	−0.5	−2.0
Total employment (000)	12.0	11.4	11.4	11.4	—	−5.0	0.0	0.0	—
Production workers (000)	9.5	9.2	9.3	9.2	—	−3.2	1.1	−1.1	—
Average hourly earnings ($)	10.82	11.00	11.22	11.46	—	1.7	2.0	2.1	—
Capital expenditures	88.1	57.0	—	—	—	−35.3	—	—	—
Product Data									
Value of shipments[5]	2,563	2,270	2,240	2,162	—	−11.4	−1.3	−3.5	—
Value of shipments (1987$)	2,563	2,508	2,543	2,528	2,480	−2.1	1.4	−0.6	−1.9

[1] Advance data from the 1988 Annual Survey of Manufactures.
[2] Estimate.
[3] Forecast.
[4] Value of all products and services sold by establishments in the gypsum products industry.
[5] Value of products classified in the gypsum products industry produced by all industries.

SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA). Estimates and forecasts by ITA.

Trends and Forecasts: Ceramic Wall and Floor Tile (SIC 3253)

(in millions of dollars except as noted)

Item	1987	1988[1]	1989[2]	1990[2]	1991[3]	Percent Change 1987-88	1988-89	1989-90	1990-91
Industry Data									
Value of shipments[4]	717	756	894	847	—	5.3	18.4	−5.3	—
Value of shipments (1987$)	717	729	844	785	758	1.7	15.8	−7.0	−3.4
Total employment (000)	9.5	9.8	10.3	10.0	—	3.2	5.1	−2.9	—
Production workers (000)	7.7	8.1	8.5	8.3	—	5.2	4.9	−2.4	—
Average hourly earnings ($)	8.63	9.50	9.77	10.06	—	10.1	2.8	2.9	—
Capital expenditures	33.2	71.9	—	—	—	116.6	—	—	—
Product Data									
Value of shipments[5]	625	674	799	757	—	7.8	18.5	−5.3	—
Value of shipments (1987$)	625	653	756	703	679	4.5	15.8	−7.0	−3.4

[1] Advance data from the 1988 Annual Survey of Manufactures.

[2] Estimate.

[3] Forecast.

[4] Value of all products and services sold by establishments in the ceramic wall and floor tile industry.

[5] Value of products classified in the ceramic wall and floor tile industry produced by all industries.

SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA). Estimates and forecasts by ITA.

Prices of ceramic tile have risen moderately in recent years. The Producer Price Index was up 1.9 percent in 1990, 2.3 percent in 1989, and 3.3 percent in 1988.

Outlook for 1991

Ceramic tile shipments should decline 3.4 percent to about 490 million square feet, reflecting the building construction downturn. Imports should continue to hold 55 to 60 percent of the U.S. market.

Long-Term Prospects

Ceramic tile consumption should grow at about 3 to 4 percent a year over the next 5 years. In the home, ceramic tile will be used not only for bathroom walls and floors, but also in kitchens and foyers. Nonresidential applications will include rest rooms, lobbies, and hallways. Decorative tiles will be particularly popular, despite their higher price. Ceramic tile will continue to benefit from the growing alterations and additions market. The beauty, durability and ease of maintenance will continue to improve the appeal of ceramic tile.—*C.B. Pitcher, Office of Forest Products and Domestic Construction, (202) 377-0132, September 1990.*

Additional References

(Call the Bureau of the Census at (301) 763-4100 for information about how to order Census documents.)

Current Industrial Reports, Clay Construction Products, M32D, Bureau of the Census, U.S. Department of Commerce, Washington, DC 20233.

MINERAL WOOL

Mineral wool insulation products are produced from materials such as sand, metal slag, or rock, and are used mostly for thermal and acoustical insulation. More than two-thirds is used for insulation of structures. Other applications are industrial, equipment, appliance, and pipe insulation. Fiberglass accounts for about two-thirds (by value) of structural mineral wool insulation.

Constant-dollar shipments were about $3.4 billion in 1990, little changed from 1989 as demand from the construction sector remained lackluster. Small increases in producers prices caused the current-dollar shipments to increase by slightly more than 1 percent.

Foreign trade is not an important factor in mineral wool insulation. Most of the imports and exports shown in the accompanying table are mineral wool products not used in construction.

Outlook for 1991

Mineral wool shipments in constant dollars will remain near their 1990 level, or about $3.4 billion, as sluggish construction activity depresses demand.

Long-Term Prospects

Over the next five years the mineral wool manufacturing industry is likely to experience only slow growth, as it con-

Trends and Forecasts: Mineral Wool (SIC 3296)

(in millions of dollars except as noted)

Item	1987	1988[1]	1989[2]	1990[2]	1991[3]	Percent Change 1987-88	1988-89	1989-90	1990-91
Industry Data									
Value of shipments[4]	3,260	3,290	3,342	3,380	—	0.9	1.6	1.1	—
Value of shipments (1987$)	3,260	3,256	3,276	3,282	3,300	−0.1	0.6	0.2	0.5
Total employment (000)	21.5	20.5	20.5	20.0	—	−4.7	0.0	−2.4	—
Production workers (000)	17.4	16.5	16.5	16.0	—	−5.2	0.0	−3.0	—
Average hourly earnings ($)	13.21	14.11	—	—	—	6.8	—	—	—
Capital expenditures	178	180	—	—	—	1.1	—	—	—
Product Data									
Value of shipments[5]	3,146	3,090	3,134	3,180	—	−1.8	1.4	1.5	—
Value of shipments (1987$)	3,146	3,066	3,065	3,087	3,107	−2.5	−0.0	0.7	0.6

[1] Advance data from the 1988 Annual Survey of Manufactures.

[2] Estimate.

[3] Forecast.

[4] Value of all products and services sold by establishments in the mineral wool industry.

[5] Value of products classified in the mineral wool industry produced by all industries.

SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA). Estimates and forecasts by ITA.

tinues to be strongly influenced by the level of housing construction. Demand for insulation products to retrofit older structures may grow in response to higher energy prices. However, this market is obviously limited.—*Robert M. Shaw, Office of Forest Products and Domestic Construction, (202) 377-0132, September 1990.*

Additional References

(Call the Bureau of the Census at (301) 763-4100 for information about how to order Census documents.)

Glass Fibers Current Industrial Report MA32J, U.S. Department of Commerce, Bureau of the Census, Industry Division, Washington, DC 20233.

Mineral Insulation Manufacturers Association, Inc., 1420 King St., Alexandria, VA 22314. Telephone: (703) 684-0084.

RSI (Roofing/Siding/Insulation), Harcourt Brace Jovanovich, Inc., 7500 Old Oak Blvd., Cleveland, OH 44130. Telephone: (216) 243-8100.

PLUMBING PRODUCTS

Plumbing fixtures are classified in three industries, according to the materials they are made from: vitreous (SIC 3261), metal (SIC 3431), and, since 1987, plastic fixtures (SIC 3088). Metal fittings used with these fixtures, such as faucets, showerheads and drains, comprise SIC 3432.

Stagnant housing construction held down demand for plumbing equipment during 1990. Total fixture product shipments were flat for the year, remaining at about $2.9 billion. Shipments of plumbing fittings rose about 6 percent to $2.9 billion. This largely reflected price changes, however, and in constant dollars shipments of fittings were nearly unchanged at $2.3 billion.

Plastics are used most commonly in bathtubs, whirlpool baths, shower stalls, and lavatory sinks, and are gaining wider acceptance in toilet flush tanks. Shipments of plastic fixtures have benefited in recent years from both growing consumer preference and an increase in the number of baths per new housing unit. Vitreous materials are used principally for bathroom fixtures—toilet bowls, flush tanks, and lavatories. Metal, enameled or stainless steel, accounts for nearly all kitchen sinks, as well as a substantial fraction of bathtubs and lavatories. Although the place of metal fixtures remains unchallenged in the kitchen, other product categories are tending in favor of other materials.

INTERNATIONAL COMPETITIVENESS

Foreign trade plays a significant role in plumbing fixtures and fittings. Imports, largely from Canada, Mexico, and the Pacific rim, are approaching 10 percent of consumption, while total exports are about half as much.

Outlook for 1991

Shipments of plumbing fixtures will decline about 1.9 percent in real terms as new housing starts continue to contract. Measured in constant dollars, fittings shipments will be about unchanged from 1990. Fittings are likely to be somewhat less sensitive than fixtures to the current slackness in housing, as more home owners opt for alterations and improvements rather than buying new houses.

Long-Term Prospects

Shipments of plumbing fixtures and fittings will depend heavily on conditions in the housing market, the principal source of demand. As construction recovers from its recent slump, the demand for plumbing equipment is likely to resume the pattern of steady growth experienced in the mid- to late-1980s.—*Robert M. Shaw, Office of Forest Products and Domestic Construction, (202) 377-0132, September 1990.*

Additional References

(Call the Bureau of the Census at (301) 763-4100 for information about how to order Census documents.)

Plumbing Fixtures Current Industrial Report MQ34E, U.S. Department of Commerce, Bureau of the Census, Industry Division, Washington, DC 20233.

Plumbing Manufacturers Institute, 800 Roosevelt Road, Building C, Glen Ellyn, IL 60137. Telephone: (708) 858-9172.

Table 4: Production of Selected Plumbing Fixtures

(thousands of units)

Item	1989	1988	1987	1986	1985	1984
Kitchen sinks	4,604	4,934	4,794	4,869	4,930	4,920
Lavatories	7,999	8,090	7,982	8,006	7,544	7,334
Water closet bowls	9,301	9,414	9,096	8,823	8,438	8,342
Flush tanks	12,169	8,343	8,262	7,997	7,994	8,167
Urinals	289	275	226	286	277	222
Bathtubs	3,850	4,022	4,063	4,019	4,060	3,889
Whirlpool baths (non-institutional)	274	287	161	131	105	93

SOURCE: U.S. Department of Commerce, Bureau of the Census.

Trends and Forecasts: Plumbing Parts (SIC 3088, 3261, 3431, 3432)

(in millions of dollars except as noted)

Item	1987	1988[1]	1989[2]	1990[2]	1991[3]	Percent Change 1987-88	1988-89	1989-90	1990-91
Industry Data									
Value of shipments[4]	4,658	5,376	5,654	5,746	—	15.4	5.2	1.6	—
3088 Plastics plumbing fix	709	927	888	791	—	30.7	−4.2	−10.9	—
3261 Vitreous plumbing fix	791	941	1,003	1,099	—	19.0	6.6	9.6	—
3431 Metal sanitary ware	946	946	954	946	—	17.8	0.9	−0.9	—
3432 Plumbing fittings	2,355	2,563	2,809	2,910	—	8.8	9.6	3.6	—
Value of shipments (1987$)	4,658	4,958	4,994	4,892	4,832	6.4	0.7	−2.0	−0.8
3088 Plastics plumbing fix	709	809	837	739	720	14.1	3.5	−11.8	−2.6
3261 Vitreous plumbing fix	791	910	937	999	983	15.0	3.0	6.7	−1.6
3431 Metal sanitary ware	803	909	874	844	829	13.2	−3.9	−3.4	−1.7
3432 Plumbing fittings	2,355	2,332	2,346	2,310	2,300	−1.0	0.6	−1.5	−0.4
Total employment (000)	42.3	46.1	46.8	46.3	—	9.0	1.5	−1.1	—
3088 Plastics plumbing fix	7.5	9.4	9.4	9.1	—	25.3	0.0	−3.2	—
3261 Vitreous plumbing fix	9.7	11.1	11.0	11.0	—	14.4	0.0	0.0	—
3431 Metal sanitary ware	8.0	7.7	7.6	7.5	—	−3.8	−1.2	−1.3	—
3432 Plumbing fittings	17.1	17.9	18.8	18.7	—	4.7	5.0	−0.5	—
Production workers (000)	32.9	36.4	37.2	37.0	—	10.6	2.2	−0.5	—
3088 Plastics plumbing fix	5.6	7.1	7.1	6.8	—	26.8	0.0	−4.2	—
3261 Vitreous plumbing fix	8.2	9.4	9.4	9.6	—	14.6	0.0	2.1	—
3431 Metal sanitary ware	6.0	6.0	5.9	5.9	—	0.0	−1.7	0.0	—
3432 Plumbing fittings	13.1	13.9	14.8	14.7	—	6.1	6.5	−0.7	—
Average hourly earnings ($)	9.16	9.56	—	—	—	4.4	—	—	—
3088 Plastics plumbing fix	7.82	8.15	—	—	—	4.2	—	—	—
3261 Vitreous plumbing fix	10.26	10.42	—	—	—	1.6	—	—	—
3431 Metal sanitary ware	10.15	11.21	—	—	—	10.4	—	—	—
3432 Plumbing fittings	8.56	8.97	9.08	9.20	—	4.8	1.2	1.3	—
Capital expenditures	128	125	—	—	—	−2.3	—	—	—
3088 Plastics plumbing fix	14.5	18.9	—	—	—	30.3	—	—	—
3261 Vitreous plumbing fix	30.9	17.3	—	—	—	−44.0	—	—	—
3431 Metal sanitary ware	20.4	21.3	—	—	—	4.4	—	—	—
3432 Plumbing fittings	61.9	67.0	—	—	—	8.2	—	—	—
Product Data									
Value of shipments[5]	4,467	5,452	5,734	5,870	—	22.1	5.2	2.4	—
3088 Plastics plumbing fix	751	1,302	1,247	1,112	—	73.3	−4.2	−10.9	—
3261 Vitreous plumbing fix	714	811	865	974	—	13.6	6.7	12.6	—
3431 Metal sanitary ware	797	849	855	848	—	6.5	0.7	−0.8	—
3432 Plumbing fittings	2,205	2,491	2,767	2,936	—	13.0	11.1	6.1	—
Value of shipments (1987$)	4,468	5,003	5,087	5,028	4,966	12.0	1.7	−1.2	−1.2
3088 Plastics plumbing fix	751	1,136	1,175	1,039	1,015	51.3	3.4	−11.6	−2.3
3261 Vitreous plumbing fix	714	790	823	902	887	10.6	4.1	9.6	−1.6
3431 Metal sanitary ware	797	811	777	757	744	1.8	−4.2	−2.6	−1.7
3432 Plumbing fittings	2,205	2,266	2,312	2,330	2,320	2.8	2.0	0.8	−0.4

[1] Advance data from the 1988 Annual Survey of Manufactures.

[2] Estimate.

[3] Forecast.

[4] Value of all products and services sold by establishments in the plumbing parts industry.

[5] Value of products classified in the plumbing parts industry produced by all industries.

SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA). Estimates and forecasts by ITA.

8

Electric Lighting and Wiring Equipment

The inflation-adjusted value of shipments by the electric lighting and wiring equipment industries declined about 2 percent during 1990. Prospects for 1991 do not appear optimistic as overall construction activity is not expected to sustain demand for construction-related products. Shipments by the lighting and wiring equipment industries are expected to decline approximately 3 percent.

For other topics related to the subject of this chapter, see chapter 5 (Construction).

The electric lighting and wiring equipment sector includes the industries of current-carrying devices (SIC 3643), noncurrent-carrying wiring devices (SIC 3644), and lighting fixtures (SICs 3645, 3646, and 3648).

The products of these sectors become integral parts of all commercial and industrial establishments and residential dwellings. The stalled construction sector did not meet the moderately bullish expectation of a housing starts rebound in 1990, and nonresidential building continued the downward cyclical trend begun in 1987. A strong renovation market could strengthen the demand for electric lighting and wiring equipment and could prove to be the key to any improvement in the industry's 1991 outlook.

CURRENT-CARRYING WIRING DEVICES

Shipments of the current-carrying wiring devices industry increased approximately 2 percent in 1990. Current-carrying wiring devices for interior electrical construction serve primarily to switch electrical current or to connect equipment to a source of power. Products of this industry include lampholders, convenience and power outlets, attachment plug caps, connector bodies, switches, dimmers, fluorescent starters, and wire connectors.

One area of growth in this industry is dimmer products. Flexible lighting control is required in today's market due to the expansion in the complexity and variety of new light sources. Customers can select from slide, preset slide, step dimmer, touch and toggle styles, as well as the traditional rotary dimmer. The new preset slide dimmers allow on/off switching without disturbing a preset level of brightness. Touch dimmers have no moving parts, and dim electronically at the touch of a finger on a metal touch pad. High-wattage (800–2000 watts) incandescent dimmers are increasingly popular in both residential and commercial installations often required for recessed, cove lighting, chandeliers, and multiple banks of incandescent lights. Energy-saving low voltage (600 watts and below) slide dimmers are increasingly popular and often used to control track lighting, recessed lighting, and landscape lighting.

Outlook for 1991

The value of industry shipments of current-carrying devices is expected to remain stable during 1991. The forecast mirrors the anticipated continued decline of a new construction market.

Long-Term Prospects

Shipments by the current-carrying wiring devices industry will follow cycles in construction activity. Offshore manufacturing will continue. Most of the major wiring device manufacturers are now making products in either Puerto Rico or Mexico. The compound annual growth rate for 1991–95 will reflect a growing retrofit market and a weak new construction market. Shipments will increase only modestly at about 2 percent compounded annually.

NONCURRENT-CARRYING WIRING DEVICES

Because of the weakness of the nonresidential construction market, the value of shipments by the noncurrent-carrying wiring devices industry declined approximately 5 percent in 1990. Products of this industry include electrical conduits and fittings; boxes for outlets, switches, and fuses; and pole and transmission line hardware.

Trends and Forecasts: Wiring Devices (SIC 3643, 3644)

(in millions of dollars except as noted)

Item	1987	1988[1]	1989[2]	1990[2]	1991[3]	Percent Change 1987–88	1988–89	1989–90	1990–91
Industry Data									
Value of shipments (1987$)	6,751	7,058	7,062	7,010	6,902	4.5	0.1	−0.7	−1.5
3643 Wiring devices, current	3,848	4,241	4,330	4,415	4,410	10.2	2.1	2.0	−0.1
3644 Wiring gds, noncurrent	2,903	2,817	2,732	2,595	2,491	−3.0	−3.0	−5.0	−4.0

[1] Advance data from the 1988 Annual Survey of Manufactures.
[2] Estimate.
[3] Forecast.

SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA). Estimates and forecasts by ITA.

Outlook for 1991

The value of industry shipments of noncurrent-carrying wiring devices is forecast to further decline 4 percent in 1991, reflecting a continuing weak new construction market.

Long-Term Prospects

With prospects for the nonresidential construction market bleak, the outlook for construction-related noncurrent-carrying wiring devices does not appear promising. The depressed level of commercial construction will probably not recover completely for several years. Given these conditions, shipments by the noncurrent-carrying wiring devices industry will grow only modestly, at about 2 percent compounded annually.

LIGHTING FIXTURES

Lighting fixtures industry shipments, undermined by lagging construction activity, declined by about 3 percent in 1990.

Regulations established by the Federal Highway Administration (FHWA) pertaining to breakaway light poles went into effect July 1, 1990. The FHWA provisions require that an 1800-lb vehicle (or its equivalent) striking a luminaire support at speeds of 20-to-60 mph cannot be slowed by more than 16.0 ft/sec. In addition, there can be no more than 4 inches of material projecting above ground level after impact, reflecting lower and lighter cars that have been developed to increase fuel efficiency. Poles meeting the requirements will be approved by the FHWA, permitting states and municipalities to receive federal matching funds for installation.

Federal laws require that fluorescent lamp ballasts be constructed with a high efficiency design to reduce internal wattage losses. Among the energy-saving ballasts now manufactured, the solid-state electronic (EL) type is registering rapid growth. An EL ballast transforms 60 hertz (Hz) current to a 20,000–60,000-Hz current flow through the lamp, which improves lamp efficacy due to greater phosphor excitation. The EL type also features less noise, less weight, reduced ballasts losses, and extended lamp life. The elimination of perceived lamp flicker with EL ballasts is also an advantage; designers of lighting systems for offices with video-display terminals (VDTs) are reportedly interested in the higher-frequency operation of EL ballasts, since it eliminates flicker and this may reduce visual fatigue on video-display terminals.

U.S. producers shipments of EL type ballasts amounted to $16.1 million in 1987, $25.5 million in 1988, and $39.8 million in 1989. Faced with the high cost of construction, opposition to nuclear plants, uncertain fossil fuel supplies, and capacity shortages, electric utilities are seeking ways to use electricity more economically and efficiently. Electric utilities, therefore, hope to meet present and future power needs, yet avoid building costly new electric plants.

Utilities across the United States offer rebates on lighting and other electrical equipment as a principal means of persuading customers to convert to energy-efficient products. Often targeted under these programs are lighting products, including ballasts, compact fluorescent and high-intensity discharge lamps, and light dimming and control systems. Under a typical rebate program, the utility offsets a portion of the cost to the end user of the energy efficient products and sometimes of the installation, also.

Security lighting retrofits are increasing. Many developers recognize that upgrading lighting systems for buildings can attract tenants and deter crime and vandalism. An updated security lighting system can also help owners comply with local laws requiring reduction in the "light pollution" caused by outdated fixtures; with cut-off optics which aim light down and out, rather than into the air, thus reducing light pollution and "trespassing" onto adjacent properties.

INTERNATIONAL COMPETITIVENESS

U.S. lighting fixture producers continue to encounter extremely stiff competition in world markets. However, several U.S. firms entered into foreign ventures in 1990. Thomas Industries entered into a joint venture with Schreder Lighting, Brussels, Belgium. Using Schreder's design and technology, Thomas Industries will manufacture and market lighting products in the U.S., Canada, and Mexico. Lithonia Lighting acquired York Lighting Corp., a Montreal, Canada, manufacturer of fluorescent lighting fixtures. The acquisition marks the first time Lithonia will have manufacturing operations located outside of the U.S.

Outlook for 1991

The 1991 outlook for lighting fixtures depends directly on the levels of new construction activity and of retrofitting or modernization work, and indirectly on the availability of credit. Assuming continued decline in new construction

Crouse-Hinds

Utilities across the United States offer rebates on lighting and other electrical equipment as a means of persuading customers to convert to energy-efficient products.

Trends and Forecasts: Lighting Fixtures (SIC 3645, 3646, 3648)

(in millions of dollars except as noted)

Item	1987	1988[1]	1989[2]	1990[2]	1991[3]	Percent Change 1987-88	1988-89	1989-90	1990-91
Industry Data									
Value of shipments[4]	6,186	6,460	6,654	6,787	6,829	4.4	3.0	2.0	0.6
Value of shipments (1987$)	6,186	6,254	6,116	5,928	5,091	1.1	-2.2	-3.1	-4.0
Total employment (000)	59.6	58.7	58.1	57.0	54.1	-1.5	-1.0	-1.9	-5.1
Production workers (000)	43.0	42.0	41.6	40.8	38.7	-2.3	-1.0	-1.9	-5.1
Average hourly earnings ($)	8.26	8.44	—	—	—	2.2	—	—	—
Product Data									
Value of shipments[5]	6,122	6,421	6,587	6,719	6,761	4.9	2.6	2.0	0.6
3645 Res lighting fixtures	1,772	1,867	1,943	2,083	2,062	5.4	4.1	7.2	-1.0
3646 Comm lighting fixtures	2,644	2,758	2,865	2,822	2,806	4.3	3.9	-1.5	-0.6
3648 Lighting equipment, nec	1,706	1,796	1,779	1,814	1,893	5.3	-0.9	2.0	4.4
Value of shipments (1987$)	6,122	6,216	6,050	5,868	5,634	1.5	-2.7	-3.0	-4.0
3645 Res lighting fixtures	1,772	1,797	1,758	1,779	1,670	1.4	-2.2	1.2	-6.1
3646 Comm lighting fixtures	2,644	2,657	2,638	2,475	2,348	0.5	-0.7	-6.2	-5.1
3648 Lighting equipment, nec	1,706	1,762	1,653	1,614	1,617	3.3	-6.2	-2.4	0.2

[1] Advance data from the 1988 Annual Survey of Manufactures.

[2] Estimate.

[3] Forecast.

[4] Value of all products and services sold by establishments in the lighting fixtures industry.

[5] Value of products classified in the lighting fixtures industry produced by all industries.

SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA). Estimates and forecasts by ITA.

and growth in retrofitting and modernization activity, shipments by the lighting fixtures industry in 1991 should drop about 4 percent in constant terms.

Long-Term Prospects

Mirroring the long-term construction forecast, the demand for products of the lighting fixtures industry should recover only slightly during the 1991-95 period. A market for retrofit is related to the common belief that innovation is less expensive than new construction. It is impossible to quantify the constraints placed on new construction for the long-term by the Financial Institutions Reform, Recovery, and Enforcement Act of 1989, which requires savings associations to maintain a stronger ratio of capital to assets and prohibits investments of more than 15 percent of their capital in one project and/or with one developer. Legislation will be a major factor in the lighting industry in the 1990s, primarily in the areas of energy efficiency and light trespass. Assuming a slight expansion in construction levels, lighting fixtures industry shipments are expected to increase during the period 1991-95 at a compound annual rate ranging from 2 to 3 percent, measured in 1987 dollars. *—Richard A. Whitley, Office of Capital Goods, (202) 377-0682, September 1990.*

Additional References

(Call the Bureau of the Census at 301-763-4100 for information about how to order Census documents.)

Electric Lighting Fixtures, Current Industrial Report Series MA-36L (89)-1; Bureau of the Census, U.S. Department of Commerce, Washington, DC 20233. Telephone: (301) 763-5194.

EC&M (Electrical Construction and Maintenance), Intertec Publishing, 888 7th Avenue, 38th Floor, New York, NY 10106. Telephone: (212) 332-0647.

Electrical Contractor, National Electrical Contractors Association, 7315 Wisconsin Avenue, Bethesda, MD 20814. Telephone: (301) 657-3110.

Electrical Wholesaling, Intertec Publishing, 888 7th Avenue, 38th Floor, New York, NY 10106. Telephone: (212) 332-0600.

Lighting and Human Performance: A Review, National Electrical Manufacturers Association, 2101 L Street, N.W., Washington, DC 20037. Telephone: (202) 457-8400.

Wiring Devices and Supplies, Current Industrial Reports, Series MA-36K (89)-1, Bureau of the Census, U.S. Department of Commerce, Washington, DC 20233. Telephone: (301) 763-2824.

Textiles

Textile industry shipments decreased 4.9 percent in 1990, after peaking in 1989. In constant dollars, the decrease was 7.3 percent. Employment in the industry dropped 2.4 percent in 1990, reflecting the slowdown in textile activity. In 1990, the textile mill industry experienced a substantial drop in profits, a reduction in capacity utilization and a decrease in capital expenditures. Foreign trade was marked by a 7 percent decline in imports, a 30 percent increase in exports and a $1.4 billion reduction in the textile trade deficit. (Products of knit outerwear mills, SIC 2253, are included in this definition of the textile industry. A sharp decline in imports of sweaters accounted for virtually all of the decline in SIC 22 imports in 1990.)

Slower 1990 activity in the U.S. textile industry (SIC 22) was in sharp contrast to the performance in the preceding three years. Textile industry growth peaked in 1989, when most sectors of the industry enjoyed record or near-record rates of output and sales. Price increases were slow to respond to the strong demand, but by mid-1989 prices increased for most of the industry's products. The production and sales gains of 1988 extended through the first three quarters of 1989. A slowdown occurred in the last quarter of 1989 reflecting the slowing of business activity throughout the U.S. economy. As 1990 opened, several retail establishments were facing bankruptcy, and all were experiencing flat retail sales and depressed textile markets. This market climate continued throughout 1990.

Before reading this chapter, please see "How to Get the Most Out of This Book" on page one. It will clarify questions you may have concerning data, forecasting methodology, the use of constant dollars, the difference between industry and products data, sources and references, and the Standard Industrial Classification system (SIC). For other topics related to the subject of this chapter, see chapter(s) 12 (Chemicals and Allied Industries); 20 (Industrial Machinery); 34 (Apparel), and 40 (Retailing).

Industry shipments by the 4-digit SIC industries aggregated within SIC 22 dropped 4.9 percent in current dollars in 1990 and by 7.3 percent in constant dollars. Lower operating rates, along with higher nonoperating costs, translated into drastic erosion of industry profitability in 1990. Net profits for the textile industry during the first half of 1990 were 76 percent below the first half of 1989, the lowest level since 1975. The most striking element depressing the industry's 1990 performance was a significant increase in nonoperating expenses. Nonoperating expenses amounted to $1,045 million during the first half of 1990, 38 percent above the $760 million incurred in the same period of 1989. These expenses chiefly reflected: (1) considerable write-offs as a result of capital losses incurred from asset sales and (2) greatly increased interest expenses from debt service requirements.

During the first half of 1990, the capacity utilization rate for textile mills was 87 percent, 2 percentage points below the utilization rate for the same six months in 1989. The tightening of credit, weak profit performance, and reduced capacity utilization rates are likely to inhibit spending for new plants and equipment in 1991.

Capital expenditures in the textile industry, which hit a record high in 1989, fell in 1990 to $2.1 billion, 8 percent below the $2.2 billion spent in 1989. Most capital expenditures were dedicated to the replacement of existing capacity with new technology, increasing productivity while reducing labor requirements.

Trends and Forecasts: Textile Mill Products (SIC 22)

(in millions of dollars except as noted)

Item	1987	1988[1]	1989[2]	1990[2]	Percent Change 1987–88	1988–89	1989–90
Industry Data							
Value of shipments[3]	62,755	64,767	69,236	65,843	3.2	6.9	−4.9
Value of shipments (1987$)	62,755	62,293	63,975	59,306	−0.7	2.7	−7.3
Total employment (000)	673	668	666	650	−0.7	−0.3	−2.4
Production workers (000)	575	571	568	550	−0.7	−0.5	−3.2
Average hourly earnings ($)	7.42	7.62	7.94	8.30	2.7	4.2	4.5
Product Data							
Value of shipments[4]	61,518	63,610	67,851	64,658	3.4	6.7	−4.7
Value of shipments (1987$)	61,518	61,120	62,771	58,251	−0.6	2.7	−7.2

[1] Advance data from the 1988 Annual Survey of Manufactures.

[2] Estimate.

[3] Value of all products and services sold by establishments in the textile mill products industry.

[4] Value of products classified in the textile mill products industry produced by all industries.

SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA). Estimates and forecasts by ITA.

Significant new technologies within the textile sectors include advanced spinning methods; robots that deliver materials and splice broken yarns; water jet and air jet looms that have replaced shuttle looms; and computers that design knit fabric and lay patterns on materials. The entire textile manufacturing process is utilizing sophisticated microprocessor-controlled monitoring to improve product quality. Technologies throughout the various textile sectors are being integrated into more flexible units with fewer overall manufacturing steps.

Employment

Total employment in the textile industry fell 2.4 percent in 1990 to 649,800 workers after declining by less than 1 percent in 1988 and in 1989. The number of production workers declined 3.1 percent in 1990 to 549,900 employees. Production workers' average hourly earnings increased 4.5 percent to $8.30.

The even sharper declines in industry employment of the early 1980s appear to have slowed, however, now that structural adjustments within the industry have occurred. Consolidation activity and the transformation to a more competitive environment have resulted in fewer but larger textile producers that have implemented labor saving techniques in their production processes. While overall employment levels are expected to continue to decline, the rate of decline should remain gradual.

The industry employed 4 percent of all manufacturing workers and 5 percent of all production workers in the United States. The textile industry is a major employer of women and minorities. Textile mills are located in every state with the greatest concentration in the Carolinas and Georgia, which combined account for 60 percent of the industry's employment.

INTERNATIONAL COMPETITIVENESS

The foreign-trade deficit for textile mill products was reduced $1.4 billion in 1990. Import growth declined while exports jumped sharply. The value of imports in 1990 totaled $6.8 billion, down 7 percent from 1989. Export growth was the industry's single most significant market development in 1990. U.S. exports of textile products reached $3.7 billion, up 30 percent from 1989. Overseas sales accounted for 6 percent of the value of industry shipments. The weaker U.S. dollar, a vigorous U.S. Government-sponsored export development program and continued economic growth in most U.S. overseas markets, have enhanced export opportunities for the U.S. textile industry. Canada was the largest foreign market ac-

American Textile Manufacturers Institute

The weaker U.S. dollar, a vigorous U.S. Government-sponsored export development program, and continued economic growth in most U.S. overseas markets have enhanced export opportunities for the U.S. textile industry.

U.S. Exports and Imports
Selected Textiles and Synthetic Fibers
(in millions of dollars except as noted)

SIC	Industry	1989	1990[1]	1991[2]	Percent Change 1989-90	Percent Change 1990-91
22BW	Broadwoven Fabric Mills					
	Value of exports	1,035	—	—	—	—
	Value of imports	2,553	—	—	—	—
221	Broadwoven Fabric Mills, Cotton					
	Value of exports	475	—	—	—	—
	Value of imports	1,066	—	—	—	—
222	Broadwoven Fabric Mills, Manmade					
	Value of exports	502	—	—	—	—
	Value of imports	1,248	—	—	—	—
223	Broadwoven Fabric Mills, Wool					
	Value of exports	56.8	—	—	—	—
	Value of imports	239	—	—	—	—
225A	Weft, Lace, & Warp Knit Fabric Mills					
	Value of exports	153	—	—	—	—
	Value of imports	139	—	—	—	—
227	Carpets and Rugs					
	Value of exports	367	—	—	—	—
	Value of imports	608	—	—	—	—
2281	Yarn spinning mills					
	Value of exports	120	—	—	—	—
	Value of imports	291	—	—	—	—
282A	Man-Made Fibers					
	Value of exports	1,419	—	—	—	—
	Value of imports	584	—	—	—	—
	Selected Textiles & Synth Fibers					
	Value of exports	3,093	—	—	—	—
	Value of imports	4,174	—	—	—	—

[1] Estimate

[2] Forecast

SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA). Estimates and forecasts by ITA.

counting for 26 percent of U.S. exports. Over half of the value of U.S. exports to Canada consisted of cotton and man-made fiber fabrics. Other major U.S. textile export markets include Mexico, the United Kingdom, and Japan. Noteworthy in 1990 among textile product exports was carpeting, which increased 30 percent.

The future of world textile trade will be influenced by the utcome of the Uruguay Round of negotiations in the eneral Agreement on Tariffs and Trade (GATT) that egan in 1986 and is scheduled to conclude at the end of 990. Negotiations in the area of textiles center around the unta del Este Declaration which proposed that trading ations consider options that would permit the eventual integration of textiles into GATT on the basis of strengthened GATT rules and disciplines.

U.S. Trade Patterns in 1989
Selected Textiles and Synthetic Fibers
SIC 221, 222, 223, 2257, 2258, 227, 2281, 2823, 2824
(in millions of dollars, percent)

Exports	Value	Share	Imports	Value	Share
Canada & Mexico	745	24.1	Canada & Mexico	356	8.5
South America	118	3.8	South America	183	4.4
European Community	670	21.6	European Community	691	16.6
East Asia NICs	508	16.4	East Asia NICs	1,219	29.2
Japan	181	5.9	Japan	516	12.4
Other	873	28.2	Other	1,208	28.9
World Total	3,393	100.0	World Total	4,175	100.0
Top Five Countries					
	Value	Share		Value	Share
Canada	494	16.0	Japan	518	12.4
Mexico	250	8.1	Italy	443	10.6
Belgium	211	6.8	South Korea	343	8.2
United Kingdom	196	6.3	China	318	7.6
Japan	181	5.9	Canada	258	6.2

See "How to Get the Most Out of This Book" for definitions of the Country Groupings.

SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA).

SPUN YARNS

Spun yarns of cotton, wool, and man-made fibers are primary products of spinning mills. The traditional spinning process is done on ring spindles. Spun yarns produced for sale represents 35 percent of all yarns produced, while the remaining portion is consumed within the same company or affiliated producing mills. Cotton and manmade fiber staple yarns continued to dominate the yarn industry's output in 1990, constituting 97 percent of domestic shipments. The value of industry (SIC 2281) shipments declined 2 percent in 1990, reflecting the weak demand for knit T-shirts and sweaters and the oversupplied fleece market for active wear.

Prices of yarns advanced in 1990, mainly reflecting higher fiber cost. By third quarter 1990, prices of raw cotton increased 16 percent over a year earlier, while manmade fiber prices advanced at a slower rate of 4 percent. Prices of cotton yarns increased 3 percent and manmade fiber yarns increased 5 percent.

Trends and Forecasts: Yarn Spinning Mills (SIC 2281)
(in millions of dollars except as noted)

Item	1987	1988[1]	1989[2]	1990[2]	Percent Change 1987-88	Percent Change 1988-89	Percent Change 1989-90
Industry Data							
ue of shipments[3]	7,502	7,279	7,497	7,362	−3.0	3.0	−1.8
e of shipments (1987$)	7,502	7,066	7,209	7,045	−5.8	2.0	−2.3
l employment (000)	89.1	83.8	81.5	78.2	−5.9	−2.7	−4.0
duction workers (000)	81.2	76.5	75.1	71.5	−5.8	−1.8	−4.8
erage hourly earnings ($)	7.19	7.43	7.81	8.16	3.3	5.1	4.5
Product Data							
e of shipments[4]	7,711	7,626	7,707	7,553	−1.1	1.1	−2.0
e of shipments (1987$)	7,711	7,402	7,411	7,228	−4.0	0.1	−2.5

dvance data from the 1988 Annual Survey of Manufactures.

stimate

alue of all products and services sold by establishments in the yarn spinning mills stry

[4] Value of products classified in the yarn spinning mills industry produced by all industries.

SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA). Estimates and forecasts by ITA.

Trends and Forecasts: Broadwoven Fabric Mills (SIC 221-223)

(in millions of dollars except as noted)

Item	1987	1988[1]	1989[2]	1990[2]	Percent Change 1987-88	Percent Change 1988-89	Percent Change 1989-90
Industry Data							
Value of shipments[3]	14,608	16,055	15,770	15,812	9.9	−1.8	0.3
Value of shipments (1987$)	14,608	15,111	14,548	14,373	3.4	−3.7	−1.2
Total employment (000)	174	180	174	166	3.4	−3.3	−4.6
Production workers (000)	154	158	152	145	2.6	−3.8	−4.6
Average hourly earnings ($)	7.76	7.98	—	—	2.8	—	—
Product Data							
Value of shipments[4]	14,324	15,308	15,178	15,419	6.9	−0.8	1.6
Value of shipments (1987$)	14,324	14,364	14,026	13,899	0.3	−2.4	−0.9

[1] Advance data from the 1988 Annual Survey of Manufactures.

[2] Estimate.

[3] Value of all products and services sold by establishments in the broadwoven fabric mills industry.

[4] Value of products classified in the broadwoven fabric mills industry produced by all industries.

SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA). Estimates and forecasts by ITA.

Trends and Forecasts: Broadwoven Fabric Mills, Cotton (SIC 221)

(in millions of dollars except as noted)

Item	1987	1988[1]	1989[2]	1990[2]	Percent Change 1987-88	Percent Change 1988-89	Percent Change 1989-90
Industry Data							
Value of shipments[3]	5,508	5,664	5,445	5,800	2.8	−3.9	6.5
Value of shipments (1987$)	5,508	5,364	5,167	5,429	−2.6	−3.7	5.1
Total employment (000)	72.3	72.3	69.1	65.9	0.0	−4.4	−4.6
Production workers (000)	64.9	64.8	61.6	58.7	−0.2	−4.9	−4.7
Average hourly earnings ($)	7.77	7.91	8.24	8.55	1.8	4.2	3.8
Product Data							
Value of shipments[4]	5,406	5,350	5,289	5,546	−1.0	−1.1	4.9
Value of shipments (1987$)	5,406	4,963	4,919	5,019	−8.2	−0.9	2.0

[1] Advance data from the 1988 Annual Survey of Manufactures.

[2] Estimate.

[3] Value of all products and services sold by establishments in the broadwoven fabric mills, cotton industry.

[4] Value of products classified in the broadwoven fabric mills, cotton industry produced by all industries.

SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA). Estimates and forecasts by ITA.

Trends and Forecasts: Broadwoven Fabric Mills, Manmade (SIC 222)

(in millions of dollars except as noted)

Item	1987	1988[1]	1989[2]	1990[2]	Percent Change 1987-88	Percent Change 1988-89	Percent Change 1989-90
Industry Data							
Value of shipments[3]	8,049	8,463	8,375	8,296	5.1	−1.0	−0.9
Value of shipments (1987$)	8,049	7,971	7,730	7,458	−1.0	−3.0	−3.5
Total employment (000)	88.3	90.4	87.5	84.2	2.4	−3.2	−3.8
Production workers (000)	77.0	78.8	76.3	72.8	2.3	−3.2	−4.6
Average hourly earnings ($)	7.80	8.10	8.45	8.79	3.8	4.3	4.0
Product Data							
Value of shipments[4]	7,772	8,332	8,256	8,393	7.2	−0.9	1.7
Value of shipments (1987$)	7,772	7,874	7,687	7,602	1.3	−2.4	−1.1

[1] Advance data from the 1988 Annual Survey of Manufactures.

[2] Estimate.

[3] Value of all products and services sold by establishments in the broadwoven fabric mills, manmade industry.

[4] Value of products classified in the broadwoven fabric mills, manmade industry produced by all industries.

SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA). Estimates and forecasts by ITA.

Trends and Forecasts: Broadwoven Fabric Mills, Wool (SIC 223)

(in millions of dollars except as noted)

Item	1987	1988[1]	1989[2]	1990[2]	Percent Change 1987-88	Percent Change 1988-89	Percent Change 1989-90
Industry Data							
Value of shipments[3]	1,051	1,928	1,950	1,716	83.4	1.1	−12.0
Value of shipments (1987$)	1,051	1,776	1,651	1,486	69.0	−7.0	−10.0
Total employment (000)	13.8	16.9	17.0	15.7	22.5	0.6	−7.6
Production workers (000)	12.1	14.6	14.6	13.4	20.7	0.0	−8.2
Average hourly earnings ($)	7.39	7.66	8.06	8.29	3.9	5.2	2.5
Product Data							
Value of shipments[4]	1,147	1,626	1,633	1,480	41.8	0.4	−9.4
Value of shipments (1987$)	1,147	1,527	1,420	1,278	33.1	−7.0	−10.0

[1] Advance data from the 1988 Annual Survey of Manufactures.

[2] Estimate.

[3] Value of all products and services sold by establishments in the broadwoven fabric mills, wool industry.

[4] Value of products classified in the broadwoven fabric mills, wool industry produced by all industries.

SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA). Estimates and forecasts by ITA.

Trends and Forecasts: Weft, Lace, and Warp Knit Fabric Mills (SIC 2257, 2258)

(in millions of dollars except as noted)

Item	1987	1988[1]	1989[2]	1990[2]	Percent Change 1987-88	1988-89	1989-90
Industry Data							
Value of shipments[3]	5,571	5,246	5,424	5,532	−5.8	3.4	2.0
Value of shipments (1987$)	5,571	5,146	5,249	5,228	−7.6	2.0	−0.4
Total employment (000)	56.4	53.6	56.3	56.9	−3.2	5.0	1.1
Production workers (000)	46.0	44.9	46.9	47.7	−2.4	4.5	1.7
Average hourly earnings ($)	7.66	7.85	8.13	8.40	2.5	3.6	3.3
Product Data							
Value of shipments[4]	5,646	5,492	5,684	5,826	−2.7	3.5	2.5
Value of shipments (1987$)	5,646	5,384	5,481	5,552	−4.6	1.8	1.3

[1] Advance data from the 1988 Annual Survey of Manufactures.

[2] Estimate.

[3] Value of all products and services sold by establishments in the weft, lace, & warp knit fabric mills industry.

[4] Value of products classified in the weft, lace, & warp knit fabric mills industry produced by all industries.

SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA). Estimates and forecasts by ITA.

Trends and Forecasts: Carpets and Rugs (SIC 227)

(in millions of dollars except as noted)

Item	1987	1988[1]	1989[2]	1990[2]	Percent Change 1987-88	1988-89	1989-90
Industry Data							
Value of shipments[3]	9,795	10,256	10,666	10,911	4.7	4.0	2.3
Value of shipments (1987$)	9,795	9,930	10,195	9,869	1.4	2.7	−3.2
Total employment (000)	53.3	54.6	56.5	58.9	2.4	3.5	4.2
Production workers (000)	40.6	42.6	44.4	44.3	4.9	4.2	−0.2
Average hourly earnings ($)	8.12	7.84	8.08	8.41	−3.4	3.1	4.1
Product Data							
Value of shipments[4]	9,291	9,758	10,159	10,037	5.0	4.1	−1.2
Value of shipments (1987$)	9,291	9,449	9,716	9,368	1.7	2.8	−3.6

[1] Advance data from the 1988 Annual Survey of Manufactures.

[2] Estimate.

[3] Value of all products and services sold by establishments in the carpets and rugs industry.

[4] Value of products classified in the carpets and rugs industry produced by all industries.

SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA). Estimates and forecasts by ITA.

Trends and Forecasts: Man-Made Fibers (SIC 2823, 2824)

(in millions of dollars except as noted)

Item	1987	1988[1]	1989[2]	1990[2]	Percent Change 1987-88	1988-89	1989-90
Industry Data							
Value of shipments[3]	11,431	12,205	12,815	13,199	6.8	5.0	3.0
Value of shipments (1987$)	11,431	11,619	11,746	11,478	1.6	1.1	−2.3
Total employment (000)	56.2	55.6	55.5	54.6	−1.1	−0.2	−1.6
Production workers (000)	42.3	41.9	42.0	41.2	−0.9	0.2	−1.9
Average hourly earnings ($)	12.36	12.86	13.10	13.89	4.0	1.9	6.0
Product Data							
Value of shipments[4]	10,115	10,675	11,252	11,483	5.5	5.4	2.1
Value of shipments (1987$)	10,115	10,202	10,515	10,439	0.9	3.1	−0.7

[1] Advance data from the 1988 Annual Survey of Manufactures.

[2] Estimate.

[3] Value of all products and services sold by establishments in the man-made fibers industry.

[4] Value of products classified in the man-made fibers industry produced by all industries.

SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA). Estimates and forecasts by ITA.

Employment in the yarn spinning industry declined 4 percent in 1990 to 78,200 employees. Spinning has traditionally been labor intensive, accounting for over half of spun yarn manufacturing costs. The industry has reduced labor costs through the installation of more modern equipment.

For example, the open-end process eliminates the need for a roving frame and a step in the winding operation. The open-end spinning production rate is 4-to-5 times faster than the traditional ring-spinning process. Other innovations in the yarn-spinning industry include spinning attachments such as automatic doffing (unloading) machines and automatic devices for splicing broken yarns.

BROADWOVEN AND KNIT FABRICS

U.S. fabric industry activity remained relatively flat in 1990. The value of industry shipments increased by less than 1 percent in current dollars and declined by 1 percent in constant dollars.

Weaving mills, which produce broadwoven fabric, accounted for 74 percent of the fabric industry's shipments. The broadwoven industry (SIC 2211, 2221, 2223) remained flat in 1990 with current dollar shipments at $15.8 billion in 1989 and in 1990. Within the broadwoven sector industry shipments varied, however. Wool fabric industry shipments fell 12 percent in 1990, reflecting the weak demand for men's tailored apparel and outerwear. Industry shipments of manmade fiber fabrics which represented 52 percent of weaving mill shipments, fell 1 percent in 1990. The drop in shipments was due to severe declines in production of printcloth and other staple fabrics.

Reductions in filament fabric demand coupled with increased imports also adversely affected the manmade fiber fabrics, sector. On the other hand, cotton broadwoven fabric shipments advanced. Industry shipments increased 7 percent in 1990, due primarily to stronger demand for denim and corduroy apparel and improved export opportunities. Manmade fibers and cotton are close substitutes in broadwoven fabric production. The competitiveness and market share of these two products will continue to be highly responsive to changes in the relative costs for the fibers, particularly petroleum base fibers.

Knit fabrics represent the remaining 26 percent of the fabric industry. Industry shipments totaled $5.5 billion in 1990, a 2 percent increase over the $5.4 billion recorded in 1989. Constant dollar shipments declined by less than one percent in 1990. Most of the decrease took place in circular knit fabric mills, where output declined due to the soft apparel market.

FLOOR COVERING MILLS

The U.S. carpet and rug industry (SIC 227) experienced three successive years of stable demand 1987–1989, resulting from healthy levels of new residential and nonresidential building construction, as well as a growing replacement and additions market. Although carpet shipments are essential to virtually all types of construction activity, the greatest product usage is in residential construction, about 55 percent, with the remaining 45 percent used in the nonresidential construction and replacement market.

Reflecting higher unit prices, the value of shipments by the carpet and rug industry totaled $10.9 billion in 1990, a 2.3 percent increase over the 1989 level. However, constant dollar shipments dropped in 1990 as a result of reduction in both residential and nonresidential construction activity and a reduction in consumer spending.

To improve profitability and control costs, most of the major carpet producers over the past several years have purchased independent yarn processing plants and integrated them into their own manufacturing operations. These same carpet mills have also moved into direct sales. In the early 1980s two-thirds of all carpet was sold through carpet distributors. In 1990, less than a quarter is sold through distributors. Carpet producers have established their own regional distribution centers and are selling their products directly to the retail sector.

INTERNATIONAL COMPETITIVENESS

Increased demand in major overseas markets resulted in carpet exports increasing nearly 30 percent in 1990. U.S. carpet producers, which do not normally sell heavily overseas, took advantage of favorable exchange rates to increase their export sales to offset declines in domestic demand.

Canada has remained the leading U.S. export market over the past two years. The largest increase in U.S. exports of carpets in 1990 was to Canada, increasing by more than 3 times the previous year level. Part of the increase is attributed to the U.S.-Canada Free Trade Agreement that became effective on January 1, 1989. The agreement provides an annual decrease of 10 percent in Canada's tariff rate until the tariff no longer exists. Carpet exports jumped from $68 million in 1989 to $200 million in 1990.

Other major markets for U.S. carpet exports are Japan, Saudi Arabia, Mexico, and Singapore. The United States is the largest carpet producing country in the world and ranks fourth in carpet exports. However, these exports represe less than 5 percent of total domestic shipments.

MANMADE FIBERS

The value of shipments by the man-made fiber indust (SIC 2823 and 2824) increased 3 percent in current dolla in 1990, but decreased 2 percent in constant dollars. Th downturn in real terms was in response to a slowdown i the general economy, especially the markets for new hou ing and autos, and a shift in consumer preferences fro man-made fibers to natural fibers, especially cotton.

The manmade fiber industry produces cellulosic fibe (SIC 2823) and noncellulosic fibers (SIC 2824). Cellulosi fibers such as rayon and acetate are made from wood-base feedstocks. Noncellulosic fibers, which include such prod ucts as nylon, acrylic, polyester, and olefin fiber, are mad from petrochemicals.

Cellulosic Fibers

Industry shipments of cellulosic fiber were down in quan tity terms in 1990 largely due to a decrease in productiv capacity. In late 1989, the nation's largest producer of rayo fiber was unable to comply with environmental regulation and was forced to cease operations. This loss of productio coupled with increased consumer demand for rayon an rayon-blended fabrics created a tight supply situation an pushed prices upward during most of 1990.

By the second half of 1990, other firms began increasin capacity to make up for the loss of production. The deman for acetate was also strong in 1990, not only in its traditiona market of fabric lining and women's fashion, but als increasingly in new markets such as young men's jackets shirts, and slacks.

Noncellulosic Fibers

The Middle-East conflict and the subsequent impact o the petroleum market during the last half of 1990 increase the cost of production in the noncellulosic fiber industr Fiber producers postponed price increases because deman was relatively weak and inventories of raw materials wer substantial. However, some firms began to announce pric increases in the last quarter of 1990 and more are expecte if the higher petroleum prices continue into 1991.

Although industry shipments of noncellulosic fibers wer up, constant dollar shipments dropped 2.3 percent in 1990 Production of polyester, nylon, and acrylic were all down with a slight increase in olefin production the only exception

Shipments of acrylic fibers have fallen for several years with production continuing to decline in 1990. The decrease i attributed to import competition, and shifts from acrylic cotton blends to polyester/cotton blends in fleece wear, an away from acrylic into cotton in hosiery and sweaters.

At midyear 1990, a major producer of acrylic fiber, ac counting for 25–35 percent of domestic production, an nounced that it would phase out its acrylic fiber business There are only three U.S. producers of acrylic fibers remaining

Nylon filament production was down in 1990 while stapl fiber production posted only a slight increase. One of th bright spots in the nylon area is spandex, an elastic fibe which is being used increasingly in sportswear and swimwear

A major producer of spandex increased its capacity in 1989 and has plans to continue increasing capacity through 1992.

Polyester production was down in 1990, but polyester also holds one of the promising areas for future production—microdenier polyester. Microdenier filament products are less than one denier in size and produce fabrics that are both light weight and exceptionally strong. The fabric is being used in casual sportswear, outerwear, and activewear with other uses planned. Microdenier filament products are not new, and both Japan and Europe have been producing similar products. Domestically, two major U.S. polyester producers have recently introduced microdenier filament and several weaving mills have begun to produce fabrics using these products.

Over the past five years production of olefin has increased and continued to grow in 1990. This growth is largely due to increased demand for polypropylene in both apparel and industrial applications. In apparel, polypropylene is used for outerwear and activewear and, because of its ability to withstand sunlight, is being used increasingly in swimwear. Polypropylene is also used for residential and commercial carpeting and automotive interior fabrics.

INTERNATIONAL COMPETITIVENESS

The value of imports of manmade fibers (SICs 2823, 2824) increased 18 percent in 1990, with major increases from Austria, Canada, and France. The majority of the increase in imports occurred in SIC 2823, cellulosic fiber reflecting the tight U.S. supply situation. The value of U.S. exports increased 6 percent in 1990. The major markets for U.S. man-made fibers include Australia, Belgium, Canada, China, and France.

Even with the weak market, worldwide capacity to produce man-made fibers is increasing. By the end of 1991, total world capacity to produce noncellulosic fibers is expected to reach 44 billion pounds, an increase of 8 percent compared to the beginning of 1990. Countries which are significantly increasing capacity include India, Indonesia, South Korea, and Taiwan. Total world productive capacity of cellulosic fiber is expected to reach 8 billion pounds by the end of 1991, an increase of 5 percent over 1990. Countries with significant growth in cellulosic fiber production include Great Britain, Hungary, the U.S.S.R., and Indonesia.—*James Bennett, Office of Textiles and Apparel, (202) 377-4058, October 1990.*

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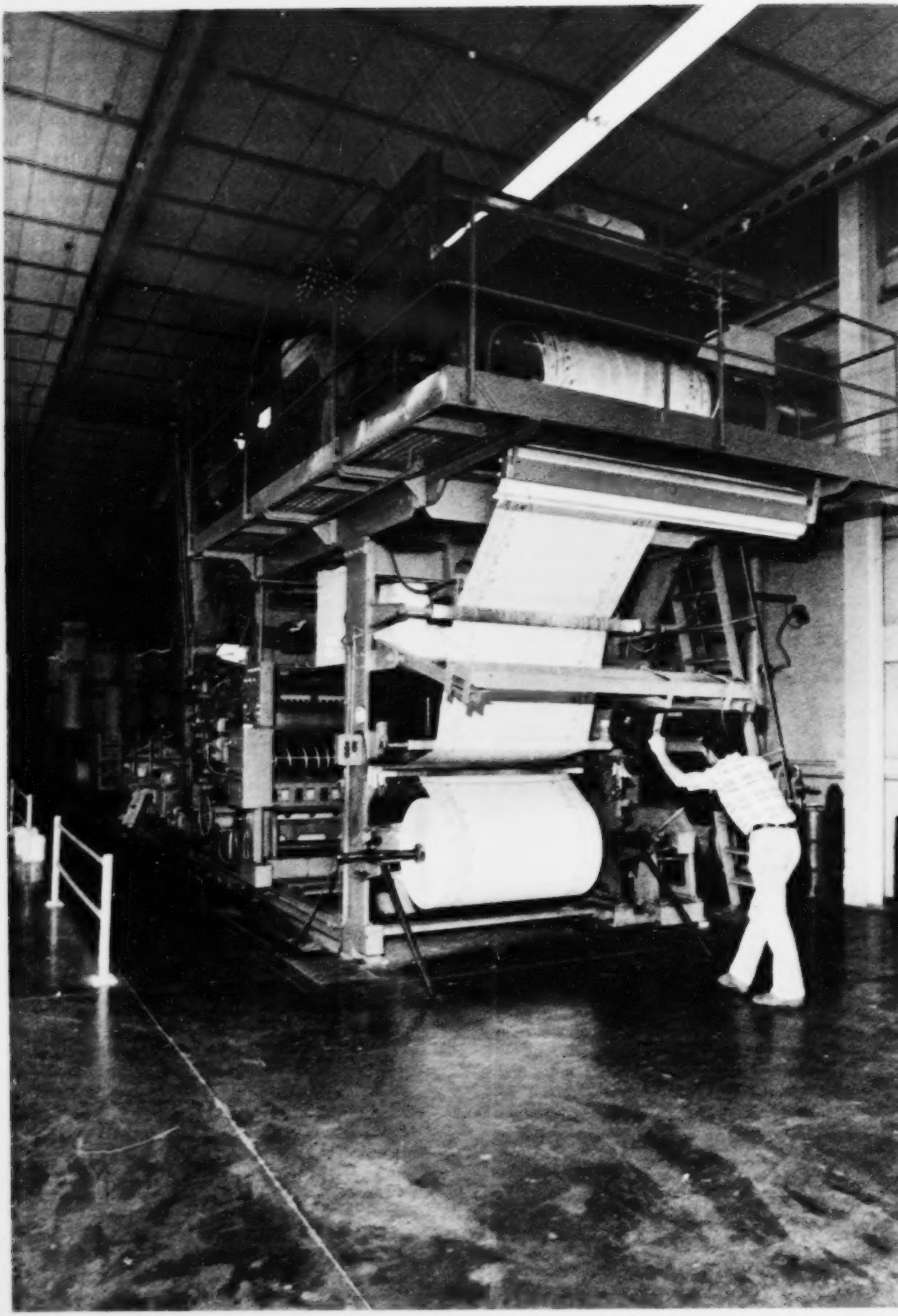

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Paper and Allied Products

Sluggish demand for market pulp and packaging materials notwithstanding, the paper and allied products industry gained an estimated 2 percent in tonnage shipped in 1990, and is expected to continue to show a 2.3 percent annual increase throughout the 1991-1995 five year forecast period. Although economic uncertainties in the United States and abroad will bear directly upon the industry's performance, there are expectations that in 1991 paper and allied products dollar sales will slightly exceed the 1990 level.

Before reading this chapter, please see "How to Get the Most Out of This Book" on page 1. It will clarify questions you may have concerning data collection precedures, factors affecting trade data, forecasting methodology, the use of constant dollars, the difference between industry and product data, sources and references, and the Standard Industrial Classification system (SIC). For other topics related to this chapter, see chapters 26 (Printing and Publishing), 33 (Food and Beverages), and 20 (Industrial Machinery).

Within SIC 26, a total of 17 separate manufacturing industries have been defined in the Standard Industrial Classification Manual for 1987. These four-digit SIC industries include pulp, paper, and paperboard mills—three large, capital-intensive, primary manufacturing sectors that process wood fibers from their own timberlands or from purchased virgin and recycled fibers. These sectors produce commodities such as woodpulp, printing and writing papers, sanitary tissue, industrial-type papers, containerboard, and boxboard.

The primary group of industries operated 526 establishments with a total of 195,600 employees in 1987. The remaining 14 industries within SIC 26 are converting operations; i.e., industries that purchase paper and paperboard from the primary producers, and convert that material into tens of thousands of finished products (stationery and office supplies, containers and boxes, bags, wallcoverings, gift wrappings, sanitary paper products, etc.). The more labor-intensive converting group of industries operated 5,768 establishments with a combined labor force of 415,700 in 1987.

The primary sector is relocating its mills into the South, close to major forest resources, although its major plant concentrations remain in the North Central and Northeast regions of the country. The largest proportion of converting establishments is in the more populous states, usually within or near large urban centers. The domestic paper and allied products industry ranks about tenth among all manufacturing industries in sales and gross investment. This industry is among the leaders in average employee compensation, and ranks fifth in energy consumption, more than one-half of which is self-generated.

Environmental issues significantly affected the industry. Legislation on waste reduction has been enacted in more than 20 states and in numerous municipalities. Meanwhile, the industry made progress in making many of its products recyclable and biodegradable, and is expected to make more such changes during the rest of the decade.

Aggregate current dollar shipments of the paper and allied products industry were estimated to have slightly exceeded $132 billion in 1990, gaining less than 1 percent over the 1989 shipments total. Weak demand from many of the industry's principal domestic markets, in combination with newly added production capacity, resulted in some paper oversupply and soft prices during 1990.

Profits, which began to taper off in 1989 after reaching high levels in 1988, were estimated to have plummeted by 15 to 20 percent in 1990 from 1989. Sanitary tissue products (SIC 2676), and coated and laminated paper products (SIC 2672) represented some of the industry's few bright spots, while higher prices for wood products in the Pacific Northwest helped bolster profits of some paper companies with integrated woodworking operations in that region.

Industry profitability was further eroded by slowly rising material and labor costs, and rapidly escalating employee health insurance costs. The industry was generally successful in holding down wage increases to an average 2.9 percent during 1990, slightly higher than in 1989. Major bargaining issues centered on eliminating excessive premium pay, controlling soaring health insurance costs, and improving worker productivity. There were some regional labor disputes and a few work stoppages, but generally, 1990 was a relatively calm year for worker-management relationships.

Paper industry capital spending for new plants and equipment remained fairly strong in 1990—a carryover from the 1988-89 period of heavy spending, totaling about $17.2 billion, 10 percent more than in 1989. Over the 1988-89 period, capital expenditures soared about 38 percent, to $15.7 billion. Sizable investments by the industry over the past few years raised production capacity by an estimated 7.5 percent in the primary paper and paperboard grades, to over 77 million metric tons, although utilization levels were down in 1990.

While the pace of company mergers and takeovers in the paper and allied products industry slowed appreciably in 1990, that year marked the single largest merger action ever affecting the industry, a $4 billion deal that created the world's largest forest products firm, with sales of about $14 billion, about 30 percent greater than its closest competitors.

Environmental Issues

The industry has always been among the leaders in expenditures on antipollution technology, especially during the 1970s. Its spending for environmental improvements exceeded $1.25 billion during the 1989–91 period—about 7 percent of total environmental outlays. Spending included almost $700 million for improving water quality, about $500 million for cleaner air, and about $60 million for handling solid waste.

The industry committed itself to attaining a 40 percent wastepaper recovery rate for domestic recycling and for export by 1995, in response to growing public pressure to reduce solid waste in municipal landfills and to conserve natural wood resources by utilizing a greater proportion of recycled fibers in its products. This will probably result in an almost 50 percent increase in wastepaper consumption by the industry during the next few years, beyond the estimated 22 million tons consumed in 1990.

An estimated one-third of the primary paper and board mills in operation during 1990 used wastepaper as their principal fiber component, while another 50 percent used between 10 and 50 percent waste materials in their papermaking process. At least 37 planned expansions of mills that will use recycled paper and board were announced in 1990.

Although similar data on the large and diverse group of converting operations was not available, a growing number of these manufacturers of packaging, household, and office products took advantage of the growing trend toward recycled fibers by advertising and promoting their "environmentally friendly" products through appropriate graphics and symbols on their labels.

Legal Protection

More legislation related to recycling is being actively considered throughout the nation. Some proposals require consumers of newsprint to use recycled fiber newsprint for a certain portion of their inputs, these include paper procurement policies favoring recycled materials; others mandate separation of newspapers from other household refuse.

Growing resistance from localities selected as sites for new landfills limit solid waste disposal alternatives. Currently, 84 percent of all municipal solid waste is disposed of in landfills, 75 percent of which are scheduled to be closed within the next 15 years. Because paper and board products constitute nearly half of most municipal solid waste, the most effective solution is to reduce the amount of wastepaper consigned to trash.

The Environmental Protection Agency (EPA) announced plans to develop regulations requiring reduction of dioxin contamination in rivers, streams, and soils, caused by chlorine bleaching of pulp and paper. In addition, the EPA announced that it will work with the Food and Drug Administration (FDA) to ensure that risks posed by dioxin

Boise Cascade Corporation

Shipments of all paper and allied products classified under SIC 26 are projected to climb about 2 percent in real terms in 1991.

in food packaging (especially paper milk cartons) and other consumer-type paper products, including coffee filters, baby diapers, and sanitary tissue products, will be further reduced.

EPA expects to have its announced guidelines drafted as proposed regulations by 1993, with final regulations projected for 1995. According to industry estimates, it will cost about $20 million at each pulp and paper bleaching plant to install the equipment necessary to reduce dioxin contamination. At the same time, EPA has concluded that there are only miniscule cancer-causing risks associated with paper and paperboard products.

INTERNATIONAL COMPETITIVENESS

The U.S. paper and allied products industry—including wastepaper—historically has had a significant deficit in foreign trade; this imbalance totaled an estimated $2.3 billion in 1990, compared to $3.3 billion in 1989 (data include wastepaper). The deficit is mainly the result of large U.S. purchases of Canadian newsprint amounting to about $4.4 billion in 1989 and 1990. Canada supplies nearly 60 percent of annual U.S. newsprint requirements.

U.S. exports of paper and allied products, which had an estimated value of $9.2 billion in 1990, have grown at a significantly faster pace than similar imports over the past few years. As a result, the industry's trade deficit has narrowed by about 28 percent over the 1989-90 period. This was largely due to increased competitiveness of U.S. products in foreign markets, resulting from the lower value of the dollar relative to other foreign currencies, and also by growing world demand for quality paper products like those manufactured in the United States.

The European Community (EC) remained the principal regional export market for U.S. paper and allied products, accounting for about 18 percent of the industry's exports in 1990. The proportion of goods sold to the EC throughout the years has gradually declined.

Japan was the leading importer of U.S. paper goods in 1990, accounting for more than 18 percent of the total value of these exports. The rapid growth of the Japanese market is attributed not only to favorable exchange rates, which have made U.S. products less costly in Japan, but also to significant tariff and nontariff concessions obtained by the United States in the recently concluded U.S.-Japanese Market Oriented Sector Specific (MOSS) talks.

Recent tariff and nontariff concessions made by Mexico upon its entry into the General Agreement on Tariffs and Trade (GATT) facilitated U.S. paper goods exports to Mexico; they now exceed those to Canada. In 1990 each nation accounted for 11.5 percent of total exports. The Pacific Rim area (excluding Japan) has also been a robust market for U.S. paper exporters. Led by South Korea, Taiwan, the People's Republic of China, and Hong Kong, this expanding Southeast Asian market accounted for about 16 percent of the value of 1990 overseas deliveries.

The bulk of U.S. paper and allied products exports consists of generally lower valued papermaking fibers and packaging mediums. These primary materials have increased from 83 percent of total exports in 1980 to 85 percent in 1990.

U.S. companies still focus on the domestic market—exports accounted for only about 6.5 percent of all paper and allied products shipments in 1990. However, some of these firms are major world suppliers of market pulp, packaging board, and printing/writing papers. An increasing amount of the industry's strategic planning and resources is spent on analyzing and gaining entry to international paper markets. The unification of the EC market in 1992 will establish common tariffs, standards, and business practices among the member countries. A number of U.S. firms are preparing to meet the pending regulations, so they can participate actively in the massive EC market. The U.S.-Canada Free Trade Agreement will eliminate tariffs on the products of the two countries' paper industries by 1993.

U.S. Exports and Imports
Paper and Allied Products
(in millions of dollars except as noted)

					Percent Change	
SIC	Industry	1989	1990[1]	1991[2]	1989-90	1990-91
26PM	Paper and Paperboard Mills					
	Value of exports	2,996	3,385	3,554	13.0	5.0
	Value of imports	7,333	7,300	7,482	−0.5	2.5
2611	Pulp mills					
	Value of exports	3,643	3,440	3,509	−5.6	2.0
	Value of imports	3,051	3,000	3,045	−1.7	1.5
2652	Setup paperboard boxes					
	Value of exports	20.0	41.0	51.0	105.0	24.4
	Value of imports	6.0	8.0	9.0	33.3	12.5
2653	Corrugated and solid fiber boxes					
	Value of exports	225	300	375	33.3	25.0
	Value of imports	30.6	38.0	43.0	24.2	13.2
2655	Fiber cans, drums & similar products					
	Value of exports	10.5	13.8	16.9	31.4	22.5
	Value of imports	2.8	2.7	2.9	−3.6	7.4
2656	Sanitary food containers					
	Value of exports	79.0	95.0	115	20.3	21.1
	Value of imports	25.6	10.0	11.0	−60.9	10.0
2657	Folding paperboard boxes					
	Value of exports	62.5	78.0	97.0	24.8	24.4
	Value of imports	75.4	84.0	93.0	11.4	10.7
2671	Paper coated & laminated, packaging					
	Value of exports	0.0	0.0	0.0	—	—
	Value of imports	0.0	0.0	0.0	—	—
2672	Paper coated and laminated, nec					
	Value of exports	459	477	506	3.9	6.1
	Value of imports	141	145	151	2.8	4.1
2673	Bags: plastics, laminated, & coated					
	Value of exports	95.5	132	178	38.2	34.8
	Value of imports	286	208	200	−27.3	−3.8
2674	Bags: uncoated paper & multiwall					
	Value of exports	32.0	47.0	65.0	46.9	38.3
	Value of imports	59.6	64.0	70.0	7.4	9.4
2675	Die-cut paper and board					
	Value of exports	74.4	12.0	12.1	−83.9	0.8
	Value of imports	19.8	9.3	9.4	−53.0	1.1
2676	Sanitary paper products					
	Value of exports	242	300	375	24.0	25.0
	Value of imports	302	174	200	−42.4	14.9
2677	Envelopes					
	Value of exports	10.0	18.7	19.9	87.0	6.4
	Value of imports	5.1	4.8	4.9	−5.9	2.1
2678	Stationery products					
	Value of exports	28.9	9.1	9.2	−68.5	1.1
	Value of imports	45.5	10.0	10.1	−78.0	1.0
2679	Converted paper products, nec					
	Value of exports	271	278	284	2.6	2.2
	Value of imports	454	467	481	2.9	3.0
	PAPER AND ALLIED PRODUCTS					
	Value of exports	8,250	8,627	9,167	4.6	6.3
	Value of imports	11,837	11,525	11,813	−2.6	2.5

[1] Estimate.

[2] Forecast.

SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA). Estimates and forecasts by ITA.

U.S. Trade Patterns in 1989
Paper and Allied Products
SIC 26
(in millions of dollars, percent)

Exports			Imports		
	Value	Share		Value	Share
Canada & Mexico	1,815	22.0	Canada & Mexico	9,358	79.1
South America	269	3.3	South America	267	2.3
European Community	1,500	18.2	European Community	686	5.8
East Asia NICs	1,258	15.2	East Asia NICs	326	2.8
Japan	1,506	18.3	Japan	191	1.6
Other	1,902	23.1	Other	1,009	8.5
World Total	8,250	100.0	World Total	11,837	100.0
Top Five Countries					
	Value	Share		Value	Share
Japan	1,506	18.3	Canada	8,975	75.8
Canada	932	11.3	Finland	386	3.3
Mexico	883	10.7	Mexico	383	3.2
West Germany	487	5.9	West Germany	326	2.8
South Korea	447	5.4	Brazil	233	2.0

See "How to Get the Most Out of This Book" for definitions of the Country Groupings.

SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA).

Imports, which comprised about 8.5 percent of the domestic consumption of paper and allied products (current value basis) in 1990, totaled an estimated $11.5 billion, an estimated 2.6 percent decline from the 1989 level. Principal suppliers to the U.S. market include Canada, Finland, West Germany, Mexico, and Brazil. Major U.S. purchases include newsprint, woodpulp, printing and writing papers, and converted office and school-type paper products. The 1989-90 drop in the value of imported paper products is due to the weaker U.S. dollar, which made foreign products more expensive in U.S. markets, and also to the sluggish domestic demand for woodpulp and communications-type papers during the period.

Outlook for 1991

Shipments of all paper and allied products classified under SIC 26 are projected to increase about 2 percent, in real terms, in 1991. This forecast is based on an anticipated slight increase in the domestic demand for paper goods and growth in U.S. exports of papermaking fibers (woodpulp and wastepaper) and packaging mediums (linerboard and bleached paperboard). Paper demand will depend largely on economic stability, supported by adequate and affordable energy supplies. Although the industry's immediate concerns will be about the state of the economy in 1991, environmental issues will bear heavily on the industry's production and marketing strategies during the year.

Long-Term Prospects

The 1991-95 period promises to be as dynamic as the 1980s for the U.S. paper and allied products industry. Significant new technological, structural, and organizational approaches should make the industry even more competitive in both domestic and international markets.

Several U.S. multinational firms will shift significant capital resources and marketing efforts to the consolidated European market and to the Pacific Rim and Caribbean regions in 1992 and beyond. The U.S. multinational companies will not only be direct participants in these emerging market areas, but will increasingly supply particular paper grades to the domestic market from lower-cost foreign-based production facilities and affiliates.

Historically, the U.S. paper industry has created new products for evolving domestic and foreign markets. An example is the increasingly popular aseptic containers used for such shelved products as fruit juices that would normally be refrigerated. The containers are constructed of several alternating layers of paper, plastic film, foil, and other materials. However, a few states are considering legislation to ban the sale of aseptic containers because they are difficult to recycle. Restrictive legislation could significantly reduce the growth rate for aseptics across the nation during the next few years. As this instance demonstrates, the industry will be increasingly affected by environmental considerations dictating the use of recycled fibers in its papermaking materials to reduce the increasing proportion of paper waste entering and remaining in municipal landfills. The industry will spend more on paper recycling facilities and equipment, as well as on reducing air and water emissions. Increased investments also will be directed to decreasing elemental chlorine bleaching processes to further reduce dioxin levels in paper products and in waste water, and conversion to more environmentally acceptable alkaline paper production from the acid-based paper production will continue.—*Leonard S. Smith, Office of Forest Products and Domestic Construction, (202) 377-0375, September 1990.*

PULP MILLS

After four consecutive years of record sales and prices, domestic shipments of market pulp (SIC 2611) declined slightly in 1990. Based on annualized six-month data, U.S. market pulp product shipments decreased from 7.75 million metric tons in 1989 to 7.64 million metric tons, representing a nearly 1.4 percent decline. Domestic and export market pulp shipments, excluding domestic transfer shipments to affiliated paper or paperboard mills, account for 12 to 15 percent of total U.S. pulp production annually. This industry is comprised of establishments primarily engaged in manufacturing pulp that is sold on the open market. Using either traditional chemical-based processes or newer mechanical or grinding techniques, the pulp is derived from softwoods, hardwoods, or other fibrous raw materials, including wastepaper, rags, cotton linters, bagasse, kenaf, or straw.

Chemical paper-grade market pulp made with sulfate (or kraft) and sulfite cooking processes is the primary output of this industry. This commodity grouping accounted for about 84 percent of all U.S. market pulp shipments in 1990. Domestic and export shipments of bleached and unbleached kraft pulp dominated the industry's sales, comprising about 79 percent of the 1990 shipments total. Product shipments of bleached and unbleached sulfite pulp totaled nearly 382,000 metric tons and represented only about 5 percent of all U.S. market pulp shipments last year.

Currently, more domestic pulping capacity exists for kraft pulp than for any other chemical or mechanical pulping process. Both softwood and hardwood kraft pulps have distinct advantages over these other pulps, including greater physical strength properties, valuable and economically retrievable pulping by-products such as tall oil and turpentine, and higher yields and lower environmental pollution control costs than other chemical pulping processes.

In 1990, shipments of dissolving and special alpha wood pulps are estimated to have decreased 8 percent, from 1.25

Trends and Forecasts: Pulp Mills (SIC 2611)

(in millions of dollars except as noted)

Item	1987	1988[1]	1989[2]	1990[2]	1991[3]	Percent Change 1987–88	Percent Change 1988–89	Percent Change 1989–90	Percent Change 1990–91
Industry Data									
Value of shipments[4]	4,314	5,219	5,900	5,500	—	21.0	13.0	−6.8	—
Value of shipments (1987$)	4,314	4,242	4,248	4,183	4,224	−1.7	0.1	−1.5	1.0
Total employment (000)	14.2	14.2	14.1	13.9	13.9	0.0	−0.7	−1.4	0.0
Production workers (000)	11.0	11.0	10.9	10.8	10.8	0.0	−0.9	−0.9	0.0
Average hourly earnings ($)	16.60	17.12	17.66	18.21	—	3.1	3.2	3.1	—
Capital expenditures	231	458	—	—	—	98.3	—	—	—
Product Data									
Value of shipments[5]	5,357	6,665	7,531	7,023	—	24.4	13.0	−6.7	—
Value of shipments (1987$)	5,357	5,417	5,422	5,341	5,394	1.1	0.1	−1.5	1.0
Quantity shipped (Thousand Metric Tons)	7,429	7,744	7,754	7,639	7,716	4.2	0.1	−1.5	1.0

[1] Advance data from the 1988 Annual Survey of Manufactures.

[2] Estimate.

[3] Forecast.

[4] Value of all products and services sold by establishments in the pulp mills industry.

[5] Value of products classified in the pulp mills industry produced by all industries.

SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA). Estimates and forecasts by ITA.

million metric tons to 1.15 million metric tons, and representing 15 percent of all U.S. market pulp shipments.

These high value-added pulps are specialty grades of chemical-based pulps produced from either alpha cellulose, wood, or cotton linters. They are used to produce regenerated cellulose, cellulose derivatives, explosives, textiles, photographic paper, and other high-value specialty papers.

The remaining portion of SIC 2611 sales in 1990 was comprised of shipments of mechanical grades, neutral sulfite semichemical (NSSC), and groundwood pulps. Last year, domestic producers of these pulps shipped about 76,400 metric tons to domestic and foreign papermakers.

The price of northern bleached softwood kraft (NBSK) pulp remained flat for the first two quarters of 1990, after more than doubling from $400 to $830 per metric ton in only three years (1986–89). However, recent reports indicate that the prices of most grades of pulp have started to weaken, followed by heavy discounting of $25 or more. In the first two quarters of 1990, prices of southern bleached softwood kraft (SBSK) declined as much as $50–75 per metric ton. In an attempt to stabilize pulp prices, U.S. market pulp producers lowered their capacity utilization rates in 1990 to ensure that inventory levels would not rise too quickly, thus precipitating a fall in prices. For the first seven months of 1990, U.S. market pulp producers operated at 95 percent of capacity, a 4 percent drop from 1989. These reduced operating rates were primarily the result of lower domestic and foreign pulp demand, especially from Western European and Pacific Rim producers of printing and writing papers.

Another negative factor influencing U.S. market pulp producers is the sizeable increase in their pulp inventory levels. In July 1990, U.S. market pulp producer inventories stood at 456,000 metric tons—equivalent to a 25-day supply—which is more than 58 percent above the July 1989 level. On a positive note, the 25-day supply was still below the 30-day supply level of 550,000 metric tons considered to be the norm for the domestic market pulp industry.

About 30 countries produce market pulp, but North American and Scandinavian (NORSCAN) producers account for nearly 70 percent of the world pulpmaking capacity. Additionally, the capacity of producers in South America—specifically Brazil, Chile, and Argentina—to make chemical paper-grade market pulp has risen sharply over the past several years and increased from only 4 percent in 1988 to more than 9 percent in 1990. These countries, which enjoy a fast-growing, abundant raw material supply base, benefit from low solid wood input costs and comparatively low labor and operating costs. These factors have increased pressure on U.S. and other NORSCAN market pulp producers to keep input and operating costs down while maintaining efficient production levels.

New Technology

U.S. market pulp producers are also competing against the world mechanical pulp sector. Mechanical pulps are produced by a grinding, refining, or other mechanical process rather than the traditional chemical-based cooking process. They are called "alphabet pulps" because of the wide variety of acronyms for the various mechanical pulping processes. They include chemi-thermomechanical pulp (CTMP), stone groundwood (SGW), refiner mechanical pulp (RMP), and pressurized groundwood (PGW). Recent technological advances in these processes have made it possible to produce a high yield (90–95 percent compared to 45–50 percent for the kraft process), high quality, uniform pulp, which can utilize a wide range of hardwoods and softwoods. Also, because of lower chemical, water, environmental, and energy (excluding electricity) requirements per unit of output, mechanical pulps are cheaper—usually more than $100 per metric ton less than chemical pulps.

About 99 percent of the world's current mechanical pulping capacity is located in only eight countries. Canada has about 41 percent of the world's mechanical pulping capacity, followed by Sweden (24 percent), New Zealand (14 percent), Norway (10 percent), Mexico (3 percent), Brazil (3 percent), Finland (3 percent), and Spain (1 percent). The U.S. mechanical market pulp capacity has lagged behind that of the other NORSCAN producers, but the United States had several mechanical pulp mills scheduled for start-up by the end of 1990.

Production Strategies

During the past several years—in direct response to the growing municipal solid waste (MSW) problem and shrinking U.S. landfill capacity—state, regional, and municipal governments have implemented a number of mandatory source separation initiatives. Domestic and foreign papermakers have increased their secondary fiber utilization, thus reducing their dependance on virgin fiber.

The United States has traditionally exported and imported large quantities of market pulp, primarily bleached and semibleached kraft pulp. In 1990, more than 74 percent of U.S. pulp exports and nearly 80 percent of U.S. imports were composed of this particular grade. A more stable U.S. dollar and moderate worldwide demand led to increased exports by domestic market pulp producers during the year. The United States was the world's leading pulp producer and the second largest exporter of market pulp—behind Canada—in 1990. Based on six-month data, U.S. market pulp exports are estimated to have decreased nearly 6.4 percent from 5.76 million metric tons to 5.39 million metric tons, accounting for almost 71 percent of the total volume of U.S. market pulp shipments. The value of these exports declined 4.7 percent from $3.64 billion to $3.44 billion. In 1990, the United States exported pulp to 99 countries. Five of them imported more than 50 percent of all U.S. pulp shipments (by volume): Japan (18 percent, after a 24 percent market share in 1989); South Korea (10 percent); West Germany (8 percent); Italy (8 percent); and the Netherlands (7 percent).

In 1990, U.S. imports of market pulp fell from 4.64 million metric tons to 4.42 million metric tons. Due to price hikes, the value of these imports fell only 1.7 percent, from about $3.1 billion in 1989 to $3.0 billion in 1990. The United States imported pulp from 19 countries in 1990, but three supplied about 99 percent of the total: Canada (90 percent), Brazil (7 percent), and South Africa (2 percent).

Outlook for 1991

Product shipments by the domestic market pulp industry are forecast to increase 1.0 percent next year, reaching an estimated 7.72 million metric tons. Slightly higher demand by U.S. and foreign papermakers (especially printing and writing paper manufacturers) for high quality pulp will result in increased sales for U.S. market pulp suppliers. International trade in market pulp is expected to remain very competitive with currency fluctuations determining who will be in the strongest worldwide trade position at any particular time. Exports and imports of market pulp are expected to increase 2 and 1.5 percent, respectively. A stable U.S. dollar would contribute to an improved trading position for U.S. market pulp suppliers.

Long-Term Prospects

Slow, continued growth is expected for the U.S. market pulp industry through 1995, with pulp shipments increasing 2 percent annually over the 5-year period. A number of anticipated economic factors will have a positive effect on U.S. pulp producers' market share and profitability. They include: higher domestic and foreign pulp paper and board demand; and a stable U.S. dollar relative to other supplier currencies. Capacity utilization rates will range from 90 to 95 percent; and pulp producers' will maintain a 20- to 25-day supply in inventory.

U.S. market pulp producers will continue to face stiff competition from many low-cost foreign producers, especially those in Brazil, Chile, Argentina, Portugal, Spain, and New Zealand, which are developing into world-class chemical and mechanical pulping industries. Due to their production advantages resulting from less costly raw material, energy, and labor, these foreign producers will attempt to make inroads on the U.S. share of the world fiber market. U.S. chemical-grade market pulp producers must also compete with pulp produced by additional domestic and foreign mechanical pulp capacity expected to come on line by 1995. Current estimates indicate that in five years total capacity for the wide range of alphabet pulps will exceed 27 million metric tons.

World consumers of market pulp will continue to substitute lower-priced alphabet pulps for high-priced chemical pulps. Fiber consumers are increasing their use of wastepaper, deinked pulp substitutes, and chemical fillers (kaolin, clay, and alkalines) as a percentage of the overall papermaking fiber mix for many paper and board products. The abundant supply of wastepaper that mandatory collection laws will elicit will probably keep wastepaper prices down. Pulp consumers attempting to keep their fiber costs down will find wastepaper a satisfactory lower priced alternative for virgin market pulp, thus spurring greater demand for wastepaper throughout the forecast period.

The U.S. pulp industry is expected to make further technical advances in its pulpmaking and bleaching capabilities. Pulping technologies need to be developed to increase pulp yield and quality, and to meet tougher guidelines. Energy requirements for pulp production must be reduced to keep production costs down and profitability at acceptable levels.—*Gary L. Stanley, Office of Forest Products and Domestic Construction, (202) 377-0375, September 1990.*

PAPER AND PAPERBOARD MILLS

Primarily due to the falling U.S. dollar and strong foreign demand for primary paper and paperboard commodities (SIC 262, 263), U.S. paper and board product shipments increased 2 percent in 1990. This increase came despite a decline in the rate of consumption by domestic paper and board converters and reduced growth in the U.S. economy.

Softer domestic demand and new capacity contributed to lower capacity utilization rates for domestic producers. At mid-year, U.S. paper mills were operating at around 92.5 percent capacity, down from 94.5 percent in 1989, and U.S. paperboard mills were operating at 93 percent, down from 95.2 percent in 1989. In 1990, total paper and paperboard production reached 70.94 million metric tons, which was almost evenly split between paper products and paperboard products.

In the domestic paper industry, the largest single commodity grouping (29 percent of all paper shipments in 1990) is uncoated free sheet paper. This commodity contains at least 90 percent sulfate (or kraft) fiber and is used in the manufacture of stationery, business, and other office papers, reprographic paper, tablets, form bond, and envelopes. Domestic output of uncoated free sheet was about 10.23 million metric tons, representing a 2.3 percent increase over the 1989 level. The latest trend involving the production of uncoated free sheet paper is the shift by domestic producers from acid sizing to alkaline sizing (i.e., utilizing precipitated calcium carbonate instead of clay or titanium dioxide). Current estimates indicate that more than one-half of all U.S. uncoated free sheet mills have converted to alkaline sizing that degrades papermaking fibers more slowly and prolongs the life span of papers for archival, reference or other publishing applications.

Trends and Forecasts: Paper and Paperboard Mills (SIC 262,263)

(in millions of dollars except as noted)

Item	1987	1988[1]	1989[2]	1990[2]	1991[3]	Percent Change 1987–88	1988–89	1989–90	1990–91
Industry Data									
Value of shipments[4]	42,645	49,828	52,400	52,100	—	16.8	5.2	−0.6	—
Value of shipments (1987$)	42,645	44,761	45,447	41,915	47,498	5.0	1.5	−7.8	13.3
Total employment (000)	181	185	185	185	185	2.2	0.0	0.0	0.0
Production workers (000)	139	143	143	143	143	2.9	0.0	0.0	0.0
Average hourly earnings ($)	15.99	16.29	16.80	17.33	—	1.9	3.1	3.2	—
Capital expenditures	3,532	4,517	—	—	—	27.9	—	—	—
Product Data									
Value of shipments[5]	40,817	47,545	54,981	54,960	—	16.5	15.6	−0.0	—
Value of shipments (1987$)	40,817	42,708	47,685	44,216	45,321	4.6	11.7	−7.3	2.5

[1] Advance data from the 1988 Annual Survey of Manufactures.

[2] Estimate.

[3] Forecast.

[4] Value of all products and services sold by establishments in the paper and paperboard mills industry.

[5] Value of products classified in the paper and paperboard mills industry produced by all industries.

SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA). Estimates and forecasts by ITA.

Coated Paper

Unexpectedly strong demand by commercial printers, magazines, catalogs, and other high-end printing and publishing areas resulted in a 3.5 percent increase in the quantity of coated paper product shipments. Coated paper accounts for nearly 20 percent (quantity basis) of all paper shipments. It is one of the higher value-added printing and writing papers. In 1990, newsprint production grew faster than any other paper grades, helping to sustain the rate of paper production at record-high levels. U.S. production of newsprint (representing 17 percent of all domestic paper shipments) reached 6.1 million metric tons in 1990, 10 percent above the 1989 level. With newsprint consumption remaining essentially flat and domestic newsprint inventories stabilized, the data suggest that more was being utilized in nonnewspaper end-uses.

Based on first-half 1990 results, domestic production of paperboard increased about 1 percent, due primarily to a strong foreign demand for U.S. containerboard. In 1990, production of containerboard increased about 1.5 percent to 24.33 million metric tons. Of that total, production of linerboard was 14.88 million metric tons (about 61 percent of all containerboard production).

Production of corrugating material was nearly 6.75 million metric tons, representing almost 28 percent of total U.S. containerboard production last year. Containerboard exports supported overall paperboard production levels in 1990. U.S. containerboard production for export (more than 9.5 percent of total U.S. containerboard production) rose 9 percent last year as both Asian and Latin American corrugated boxmakers as well as traditional West European converters relied heavily on U.S. containerboard as a principal source of raw materials for their manufacturing plants.

Boxboard Production

Domestic production of boxboard, which represents about 31 percent of total U.S. paperboard production, was essentially flat in 1990 remaining at 10.92 million metric tons. Production of recycled paperboard fell slightly, partially because of limited demand for construction-related gypsum wallboard liner and panelboard. Larger boxboard exports allowed total boxboard production to remain at its 1989 level. In 1990, exports of boxboard (accounting for more than 7 percent of total U.S. boxboard production) increased from 783,120 metric tons in 1989 to 947,580 metric tons in 1990—a 21 percent increase from year-to-year.

The industry in 1990 added about 2.27 million metric tons of paper and board making capacity. The combination of higher capacity, weaker demand, and consumer inventory reductions resulted in lower prices for many paper and board grades and the deferral of announced price increases for others. The bulk of the capacity additions came from paper machine capacity expansions and modernization projects, as opposed to new paper and board machines or greenfield mills. Coupled with lower capacity utilization rates, higher material and labor costs, and higher fixed operating and energy costs, the softening in prices led to lower overall profitability for most domestic paper and board manufacturers. To prevent substantial increases in producer inventories many paper and board producers either lowered production rates even further or allowed significant amounts of mill or machine down-time.

Outlook for 1991

Domestic product shipments of paper and paperboard are expected to increase by 2.5 percent in 1991. Although production is expected to increase next year, the anticipated surge in capacity will outstrip the demand, especially in newsprint, coated papers, and uncoated free sheet paper. This occurrence will probably result in even lower operating rates and profitability and will place pressure on producers to maintain or lower prices to increase sales. Capital spending by domestic producers will remain high, but will fall substantially from the levels of 1988–90. The U.S. industry is usually focused on the domestic market, however, much of the additional tonnage brought on-line over the next year will be destined for overseas markets, especially Southeast Asia and Latin America.

The strength of the U.S. dollar will prove to be a pivotal factor affecting the outlook for both paper and paperboard. A stronger dollar relative to foreign currencies would inhibit producers' ability to sell surplus output in foreign markets by raising the price of these goods abroad. Growth in U.S. exports of paper and paperboard will again depend largely upon demand by Asian and Latin American boxmakers and converters. The U.S. dollar had shown signs of weakening even further in the last half of 1990, which will translate into higher paper and board exports and lower imports. This should mean higher demand for U.S. paper and paperboard in 1991.

Long-Term Prospects

Expansion in domestic and foreign demand for paper and paperboard is expected over the 1991-95 period, but growth will be at a more moderate pace. Sales of paper and paperboard will increase roughly 2.3 percent per year over the forecast period, depending on several economic variables. Unless burdened by a stronger U.S. dollar, domestic manufacturers are cost competitive worldwide and are expected to maintain their share of worldwide paper and board sales. Many forecasts indicate that the long-term growth rate for world paper and board consumption should average between 2.5 and 2.9 percent per year through 1995, which should translate into higher sales for U.S. paper and board manufacturers.

The projected slow growth for the nation's GNP over the next five years will affect the paper and paperboard sectors, which traditionally correlate closely with the performance of the domestic economy. U.S. paper and board companies have increased their international competitiveness by lowering operating and input costs dramatically over the past five years, making the United States one of the lowest-cost paper producers in the world.

Recycling

The industry will utilize even greater quantities of secondary fiber as a result of consumer awareness, legislative requirements, and product preferences. This is especially true in the production of newsprint. Although annual consumption of newsprint is expected to be flat over the next five years and profit margins will be small, consumer and environmental concerns will impel the U.S. paper industry to either retrofit existing paper machinery or purchase new equipment to utilize old newsprint in its papermaking fiber mix.

As the single largest component (about 40-45 percent) of domestic MSW, paper and paperboard has been the target of most recycling initiatives or legislation. Unfortunately, the supply of collected waste paper and board has far outstripped demand (especially for waste newsprint, old corrugated containers, and mixed unsorted wastepaper). This has led to the disruption of the established market and a rapid reduction in wastepaper prices, factors that have encouraged world paper and board producers to explore new avenues for utilizing secondary fiber as a papermaking raw material. Although the use of waste-based fiber can significantly reduce fiber input costs, savings could be partially offset by increased paper machine maintenance, higher operating costs, and quality-control problems. For example, the production of alkaline printing and writing papers increases the pH level of pulp and upsets the balance required in traditional acid-based papermaking operations.

The major shift toward the alkaline papermaking process in the manufacturing of printing and writing papers will continue, based on the increased availability of both on-site and off-site calcium carbonate facilities required for conversion of fine paper mills from the standard acid system to the alkaline system. The continued development and improvement of this particular papermaking process will create new end-uses for alkaline printing and writing papers.

As in the past decade, the paper and paperboard market will remain dynamic. To take advantage of expanding market opportunities and to remain competitive, producers will need to adopt new technologies, management styles, and marketing strategies. Although reports indicate that the computer, facsimile machine, or other electronic printing devices will supplant paper in business, the opposite appears to be happening. Such electronic equipment has, in fact, stimulated the demand for paper by opening up new avenues of business.

The new marketing vision for paper and paperboard products will center around customer needs and specifications rather than overall productive capacity. State-of-the-art producers are already tailoring traditional commodity grades to individual customer designs and specifications. Specialized production capabilities will increase the demand for U.S. paper and paperboard by creating new domestic and overseas customers.—*Gary L. Stanley, Office of Forest Products and Domestic Construction, (202) 377-0375, September 1990.*

CORRUGATED AND SOLID FIBER BOXES

Constant dollar shipments of corrugated and solid fiber boxes in 1990 increased an estimated 1 percent, compared to almost 2 percent in 1989. This sector's slow rate of growth is related to the national economic slowdown that adversely affected demand for durable and nondurable goods shipped in paperboard containers. The volume gain

Trends and Forecasts: Corrugated and Solid Fiber Boxes (SIC 2653)
(in millions of dollars except as noted)

Item	1987	1988[1]	1989[2]	1990[2]	1991[3]	Percent Change 1987-88	1988-89	1989-90	1990-91
Industry Data									
Value of shipments[4]	16,107	17,755	18,473	18,120	—	10.2	4.0	−1.9	—
Value of shipments (1987$)	16,107	16,350	16,612	16,778	17,113	1.5	1.6	1.0	2.0
Total employment (000)	106	106	106	106	107	0.0	0.0	0.0	0.9
Production workers (000)	77.2	78.0	78.2	78.3	78.5	1.0	0.3	0.1	0.3
Average hourly earnings ($)	10.21	10.43	10.70	11.00	—	2.2	2.6	2.8	—
Capital expenditures	469	474	—	—	—	1.1	—	—	—
Product Data									
Value of shipments[5]	15,602	17,297	18,023	17,617	—	10.9	4.2	−2.3	—
Value of shipments (1987$)	15,602	15,896	16,150	16,312	16,638	1.9	1.6	1.0	2.0

[1] Advance data from the 1988 Annual Survey of Manufactures.

[2] Estimate.

[3] Forecast.

[4] Value of all products and services sold by establishments in the corrugated and solid fiber boxes industry.

[5] Value of products classified in the corrugated and solid fiber boxes industry produced by all industries.

SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA). Estimates and forecasts by ITA.

in 1990 marked the fifth consecutive year of real growth for corrugated products—the preferred medium for shipping more than 90 percent of all goods that require some form of protective container for transport. Corrugated and solid fiber box shipments, which reached a record of about 316.5 billion square feet in volume in 1990, now represent about 60 percent of the combined sales (totaling about $31 billion) of all domestic paper packaging sectors. By comparison, the European Community (EC), led by West Germany, shipped an estimated 225 billion square feet of corrugated products in 1990, up about 5 percent over the 1989 level. Collectively, the EC countries now represent the world's second largest producer of corrugated shipping containers, second only to the United States.

Although the domestic corrugated industry recorded a small increase in growth during 1990, average prices for its products—about 70 percent of which were in the form of shipping containers—were under heavy pressure from end-users. Announced price increases in early 1990 for containerboard, the principal raw material used in corrugated products manufacture, were subsequently cancelled, and prices actually declined as the result of frequent regional discounting. The lower prices on containerboard translated into lower prices for corrugated products, an estimated 3 percent decline in 1990. Another round of price increases in the range of $30 to $40 a ton for linerboard was announced by several major U.S. producers for October 1990, but it is uncertain whether such increases will be viable in a period of economic slowdown.

Industry Trends

Corrugated products not only include shipping containers, but also retail displays, packaging for consumer goods, pallets, slipsheets, prefabricated structures, pouches, tubes, sleeves, auto window sunscreens, cushioning, and pads. In 1990, corrugated products accounted for about 28 percent of the combined value of all domestic paper and nonpaper packaging sales, second only to metal containers as a packaging medium (see chapter 11, Cans and Containers).

About 91 percent of the corrugated board products manufactured over the 1989-90 period consisted of single-wall board; virtually all of the remainder was double-wall board, except for a very small quantity (less than one-half of 1 percent) of triple-wall board. While corrugated products gained substantial market share in recent years at the expense of wooden containers and pallets and metal drums, they faced increased competition in 1990 from rigid plastic containers and from heavy duty plastic shrink/stretch film wraps for bundling palletized loads.

Despite competition from plastic alternatives, corrugated products have easily retained their dominant share of he shipping container market. Corrugated products have a reputation for being highly recyclable, compared to more durable, but hard-to-dispose-of plastics. Industry sources estimate that domestic per capita consumption of corrugated containers totaled 74 kilograms, or about 125 boxes per person. Domestic per capita box consumption is about 6 percent higher than in Japan (about 64 kilograms per person) and more than double EC consumption.

Although tight supplies of containerboard have become evident recently, this was not a problem over the 1989-90 period, when additional production capacity satisfied domestic demand and provided increased tonnage for export. The shifting of some output from kraft packaging papers (consumption has declined in recent years under market pressure from plastic films) has helped to increase domestic containerboard capacity. In 1990, containerboard manufacturers operated at about 92.5 percent of capacity, compared to about 94.5 percent in 1989.

Further upgrades and additions of "swing" machines capable of producing kraft packaging papers or containerboard have enabled containerboard producers to support inventory levels averaging more than five and one-half weeks' supply through the first-half of 1990. The growing implementation of highly automated manufacturing and distribution procedures has largely done away with the need for maintaining unwieldy containerboard stocks, lessening industry concerns over inventory levels.

Exports

In 1990, U.S. linerboard exports, representing about 12 percent of the total value of all U.S. paper and allied products, totaled about 2.6 million short tons valued at about $1.1 billion, up about 9 percent and 6 percent, respectively, over 1989 levels. Principal foreign buyers for U.S. kraft linerboard, the second leading paper industry export after bleached sulfate woodpulp (value basis), included the EC, especially the United Kingdom and West Germany; the Pacific Rim, especially Japan, the People's Republic of China, and Hong Kong; and Latin America, especially Mexico, Ecuador, and Costa Rica.

While linerboard has emerged as one of the U.S. paper industry's major exports in recent years, corrugated products (primarily boxes) exports have climbed at an even faster rate, rising an estimated 30 percent in quantity and more than 30 percent in value over the 1989-90 period. Part of the growth in exports may be attributable to more complete reporting of U.S. exports to Canada. (See "How to Get the Most Out of This Book" for an explanation of the reporting change.) Mexico, Canada, and the Caribbean region were the principal U.S. markets.

Exports of corrugated boxes are constrained by their bulkiness and relatively high transport costs, which limit viable export markets to nearby countries. Mexico and Canada together account for almost 85 percent of the total 1990 value of U.S. corrugated product exports.

Markets for Corrugated Boxes

At the start of 1990, the U.S. corrugating industry contained an estimated 1,568 plants, including 926 sheeting facilities (plants that manufacture boxes and other products from purchased board) and 642 corrugated plants (larger scale, integrated facilities that produce containerboard and also manufacture boxes and similar products). Corrugated plants accounted for about 86 percent of the industry's total shipments volume in 1990, with sheeting plants accounting for the remainder. By comparison, an estimated 534 corrugated plants operated in the EC in 1990, with the United Kingdom, West Germany, and Spain accounting for the largest number.

In 1989 (the latest year for which such information is available), about 75 percent of the corrugating industry's shipments were directed to nondurable goods markets, slightly greater than the 1988 proportion (74 percent). Food and beverages continued to account for the largest share of corrugated products—about 39 percent in 1989. Other significant nondurables markets included paper and printing, 20 percent; chemicals, 7 percent; rubber and plastics, 6 percent; and textiles and apparel, 3 percent.

Among durables markets, which accounted for about 25 percent of 1989 corrugated shipments, the stone, clay, and glass products industries purchased a combined 7 percent of the total; machinery, 5 percent; lumber and furniture, 4 percent; and metals, 3 percent. Miscellaneous manufactures such as toys, amusements, and sporting and athletic goods, accounted for the largest portion of durable goods purchases, representing about 6 percent of the total (see chapters 6, Wood Products; 11, Cans and Containers; 15, Metals; 20, Industrial Machinery; and 38, Household Consumer Durables).

Corrugated and fiber box shipments reached a record 316.5 billion feet in 1990 and now represent 60 percent of all sales within the paper packaging sector.

Markets for corrugated products, especially slipsheets, dunnage, separators, liners, and wrap-arounds, continued to grow in 1990, although at a slower rate than in the previous year. The market for preprinted, as well as postprinted, linerboard expanded further in 1990, as corrugated boxes and similar products continued their evolution from mere shipping mediums to eye-catching marketing tools used for retail displays and promotions.

Outlook for 1991

The value of shipments of corrugated and solid fiber products is projected to increase about 2 percent in 1991, double the estimated rate of increase for 1990, but falling short of the industry's long-term compound annual growth rate of about 2.5 percent during the 1970–90 period. As in the past, corrugated product shipments, especially shipping containers, will provide an excellent barometer of U.S. business activity in the short-term, narrowly preceding GNP movements that are expected to change little from the sluggish 1990 economic performance.

Corrugated product exports will likely continue to show some significant growth, especially to neighboring country markets, while containerboard exports will also continue to grow, but at a much slower pace. The Pacific Rim will likely be the foreign market area of greatest potential for U.S. containerboard sales in 1991, with companies within Latin America also making larger purchases. This projection is largely contingent upon continuing economic and political stability worldwide.

Long-Term Prospects

The corrugating industry is expected to grow at an annual rate of 2.2 percent in 1991–95. Preprinted corrugated shipping containers and similar products, with more colors and graphics, will continue to find new applications, especially in consumer-related products. Product development efforts will concentrate on laminates, coatings, adhesives, and inks; further emphasis will be placed on the use of E-Flute board in shipping containers so that they can also serve as point-of-purchase displays. Computerization and automation in all phases of box plant operations will increase and modifications of existing box specifications from burst strength to compression and edge crush will continue.

Corrugated products will continue to compete for market share against flexible plastics, especially shrink and stretch films used to consolidate palletized loads; nevertheless, environmental pressures to limit or ban plastic packaging should constrain use of such plastic films. Principal growth markets are expected to be shipping and packaging paper and allied products, and fresh produce and meats.

U.S. exports of corrugated products are forecast to increase fairly significantly over the 5-year period, led by sales to the Pacific Rim and Latin American nations. The corrugated industry will capitalize on the increased concerns about solid waste disposal and environmental issues, pointing out how its products are readily biodegradable and recyclable. The industry will use more recycled board in its corrugated products and will try to increase the already high recycling rate of its shipping containers by improving its waste collection and distribution systems. At the same time, the industry will continue to oppose new packaging and energy taxes on its manufactures that would put them at a disadvantage with other packaging and shipping mediums.

The corrugated industry will continue to improve the strength, printability, moisture, and flame retardance of its board products. The goal is to decrease the present level of board flammability by about 60 percent from current levels. The U.S. industry is a world leader in this area of research and development.—*Leonard Smith, Office of Forest Products and Domestic Construction, (202) 377-0375, September 1990.*

FOLDING PAPERBOARD BOXES

Shipments of folding paperboard boxes and cartons were estimated to have increased about 1 percent in volume in 1990, slightly up from the industry's virtually flat performance in 1989. This marked the fifth consecutive year in which tonnage shipments either equalled or exceeded the previous year's level. The shipments growth matched the industry's long-term compound annual growth rate for the 1972-89 period.

In 1990, folding carton shipments reached a record 3.1 million short tons, while prices for those products increased an average 6 percent. Higher costs for labor and raw materials, especially solid bleached sulfate (SBS) board, have been the main cause of higher folding box prices over the past few years. Over the 1988-90 period, the domestic industry earned an estimated annual 4 percent profit after taxes, and reported an after tax return on equity of about 15 percent. By comparison, the combined Western European folding carton industry—second in the world in size after its U.S. counterpart—averaged only about 3 percent profit after taxes and had an after tax return of about 10 percent on equity.

As part of the 1987 revision of the Standard Industrial Classification (SIC) system, the former code for folding paperboard boxes, 2651, was eliminated. A new SIC, 2657, for folding paperboard boxes was added and the industry definition was expanded to include sanitary containers for frozen foods, butter, and other moist or oily foods, formerly grouped under SIC 2654 (now SIC 2656). The addition of this large food container category, with shipments estimated at about $1.1 billion in 1990, expanded the current dollar value of folding box shipments under the 1987 definition by about 16 to 18 percent annually over the 1987-90 period. During that time, real growth in this added commodity grouping was estimated to have been about 2.5 percent annually, spurred by an increasing consumer preference for packaged convenience foods and ready-to-cook meals. Under the 1987 SIC revision, folding paperboard milk cartons are included in Sanitary Food Containers (SIC 2656). (The narrative section on SIC 2656 is being omitted in the 1991 Outlook). To ensure full coverage of paperboard carton activities, milk cartons are included in this discussion of SIC 2657.

Growth in the folding carton industry during the past few years was due to the demand for packaging materials by the domestic food and beverage industry. In 1989, this market purchased about 65 percent of the folding carton tonnage shipped (59 percent in 1979) and 59 percent of the total value of such deliveries (53 percent in 1979).

Market Expansion

In 1990, tonnage shipments of folding cartons to several end-use markets were estimated to have increased significantly. These markets included cosmetics, beverage carriers, sporting goods and toys, hardware, and wet and dry foods. Purchases for use in packaging tobacco, medicinal products, beverages, and paper products declined. On a dollar value basis, materials used for packaging sporting goods and toys and wet foods grew fastest in 1990, while those used for beverages and medicinal products declined the most. During the past decade, folding cartons for retail and laundry use and for beverage carriers achieved the largest tonnage gains, while those used for medicinal products and beverages recorded the steepest declines.

During the past several years, competition from plastics alternatives, especially flexible bags and wraps and rigid carriers and containers, has limited folding paperboard carton sales growth. Corrugated board products and clamshell and carded blister packs have also been used in place of paperboard cartons. Nevertheless, folding carton sales have grown steadily but slowly, bolstered by expanding end-use applications, especially in food-related packaging, and because of better, more attractively-designed boxes.

Shipments of paperboard milk cartons were estimated to have increased slightly in volume over the 1989-90 period, totaling about 502,000 tons and numbering about 18 billion units in 1990. Milk cartons of all sizes had an estimated combined value of about $625 million (about one-fourth the total value of SIC 2656 shipments) in 1990. Units of one quart or larger grew at the expense of plastic containers of similar size. A highly successful promotional campaign conducted by the industry in the early 1980s, which cited studies showing that milk packaged in paperboard cartons retained its nutritional value while milk in plastic containers lost vitamins, was instrumental in reversing the steady decline in sales of paperboard milk cartons during the 1970s. However, the advantage regained by the paperboard carton narrowed over the 1989-90 period, when it was discovered that milk cartons contained trace amounts of highly toxic dioxins. Additional studies on the

Trends and Forecasts: Folding Paperboard Boxes (SIC 2657)

(in millions of dollars except as noted)

						Percent Change			
Item	1987	1988[1]	1989[2]	1990[2]	1991[3]	1987-88	1988-89	1989-90	1990-91
Industry Data									
Value of shipments[4]	5,705	6,094	6,564	6,856	—	6.8	8.2	4.0	—
Value of shipments (1987$)	5,705	5,807	5,810	5,865	5,953	1.8	0.1	0.9	1.5
Total employment (000)	50.7	50.9	50.9	51.0	51.1	0.4	0.0	0.2	0.2
Production workers (000)	39.9	40.4	40.4	40.5	40.6	1.3	0.0	0.2	0.2
Average hourly earnings ($)	10.40	10.59	10.85	11.05	—	1.8	2.5	1.8	—
Capital expenditures	181	218	—	—	—	20.4	—	—	—
Product Data									
Value of shipments[5]	5,522	5,856	6,333	6,588	—	6.0	8.1	4.0	—
Value of shipments (1987$)	5,522	5,580	5,580	5,636	5,720	1.1	0.0	1.0	1.5

[1] Advance data from the 1988 Annual Survey of Manufactures.

[2] Estimate.

[3] Forecast.

[4] Value of all products and services sold by establishments in the folding paperboard boxes industry.

[5] Value of products classified in the folding paperboard boxes industry produced by all industries.

SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA). Estimates and forecasts by ITA.

dioxin problem are being conducted by both the industry and the U.S. Government, and the paperboard industry is striving to reduce dioxin levels further.

Folding Cartons

In 1990 the folding carton industry consumed an estimated 3.5 million metric tons of boxboard, slightly above the 1989 level. Fluctuations in the mix of boxboard used by the folding carton industry in recent years have been largely determined by changing costs and supplies of materials and by shifting demand patterns within end-user markets, as well as by environmental pressures to recover, recycle, and conserve raw materials. While complying with environmental pressures to use more recycled board in their product mix, the industry's preferred boxmaking materials remain the so-called virgin grades. This is evidenced by the estimated 51 percent share of total boxboard consumption held by SBS and kraft board (both nonrecyclable grades) in 1990. This proportion compared with a 53 percent share held by the virgin grades in 1980.

Solid bleached sulfate has traditionally been the principal grade of boxboard used by the industry, preferred by many boxmakers because of its strength and relative purity for packaging wet foods, cosmetics, and medicinal-type products. Clay-coated board, a recycled grade, is the second largest type of board consumed by the industry; consumption of this type of boxboard has grown faster than any other during the past 10 years.

At the start of 1990, an estimated 490 folding carton plants were in operation, about the same number as in early 1989. About 16 percent of the plants were integrated with board mills. The largest concentrations of mills were in the Great Lakes and Middle Atlantic regions. By comparison, the large but highly fragmented, less-efficient West European folding carton industry consisted of slightly more than 900 plants; yet, per capita folding carton consumption in Western Europe, at about 9 kilograms per person, was only slightly more than one-half that of the United States (more than 17 kilograms per person).

Foreign trade has not been a major factor in the folding carton industry, accounting for less than 1 percent of total shipments. The high cost of transporting bulky, relatively low-valued boxes over long distances has precluded any serious industry attempts to increase exports significantly, except to adjacent markets in Mexico and Canada, which together accounted for close to 85 percent of the total value of folding carton exports in 1990. Although imports (as reported by the Bureau of the Census) comprise less than 1 percent of the total U.S. supply of folding cartons, the domestic industry has been concerned over what are believed to be large quantities of unreported boxes that are used to prepackage foreign-made consumer goods flowing into the United States. This practice precludes the need for further packaging in the United States and results in the loss of potentially significant folding carton sales. Data on the quantity and value of foreign prepackaging are not available and cannot be determined under present U.S. Customs reporting procedures.

Outlook for 1991

Shipments of folding paperboard boxes are forecast to rise slightly in 1991, increasing less than 2 percent in real terms. This cautious projection is based on uncertainties affecting the growth of the U.S. economy in 1991. This growth could be affected by a worsening budget deficit and by disruptions in the supply and price of petroleum. These and other economic factors would probably have a constraining influence on the level of business activity, consumer purchases, and ultimately, packaging demand.

Long-Term Prospects

During the 1991-95 period, folding carton shipments are projected to increase about 1.2 percent, compounded annually, as consumer nondurables markets continue their slow growth. The apparently small annual rise in the value of the industry's shipments in past and future years is not a true indication of the industry's real growth, because steadily improving technology has enabled the folding carton sector to produce lower density, lighter weight, stronger cartons, using less boxboard.

The industry is expected to continue to improve packaging design and graphics, coatings, inks, and other aspects of boxmaking. Competition in end-user markets will continue to be strong, coming mostly from plastic alternatives. Pressures by environmental concerns to severely restrict nonbiodegradable plastic products could be a boon for the folding paperboard box industry, which will increasingly stress the biodegradability of its paper-based products. Similarly, the industry is also likely to employ an increasing proportion of recycled board into its raw material product mix over the five-year period.

Folding cartons for fast and convenience foods are projected to be one of the industry's principal growth areas during the next five years. Greater consumption of packaged single portion meals is expected due to an expanding senior adult population and the increasing proportion of working family members in the average U.S. household.—*Leonard S. Smith, Office of Forest Products and Domestic Construction, (202) 377-0375, September 1990.*

SANITARY PAPER PRODUCTS

The constant dollar value of domestic sanitary paper products shipments achieved an estimated 2.5 percent rate of growth in 1990, or a slightly larger increase than in the 1988-89 period, despite the low growth rate of the U.S. economy and less consumer spending. Several of the industry's major product lines are considered nondiscretionary, and have become near-recession proof, as evidenced by their historical sales patterns. These products, which are now an integral part of everyday domestic life, include toilet tissue, toweling, and feminine hygiene products; it can be increasingly argued that disposable diapers fall into the same category. Although there has been some substitution of generic, less expensive products for brand name items when business activity and/or consumer spending declined, the industry has been able to attain moderate real growth during the past several years. It is also the most dynamic, highly competitive, technologically-advanced, domestic paper manufacturing sector.

Sanitary tissue (including toilet tissue, toweling, facial tissue, and napkins) accounted for about 56 percent of the total value of 1990 shipments of sanitary paper products. The proportion of sanitary tissue shipments to total ship-

Trends and Forecasts: Sanitary Paper Products (SIC 2676)

(in millions of dollars except as noted)

Item	1987	1988[1]	1989[2]	1990[2]	1991[3]	Percent Change 1987-88	1988-89	1989-90	1990-91
Industry Data									
Value of shipments[4]	11,698	12,117	13,089	14,079	—	3.6	8.0	7.6	—
Value of shipments (1987$)	11,698	11,677	11,910	12,200	12,506	−0.2	2.0	2.4	2.5
Total employment (000)	38.4	37.3	37.5	37.5	38.0	−2.9	0.5	0.0	1.3
Production workers (000)	29.9	29.2	29.4	29.4	29.8	−2.3	0.7	0.0	1.4
Average hourly earnings ($)	13.77	14.11	14.52	14.95	—	2.5	2.9	3.0	—
Capital expenditures	430	479	—	—	—	11.4	—	—	—
Product Data									
Value of shipments[5]	11,172	11,585	12,515	13,471	—	3.7	8.0	7.6	—
Value of shipments (1987$)	11,172	11,165	11,388	11,673	11,965	−0.1	2.0	2.5	2.5

[1] Advance data from the 1988 Annual Survey of Manufactures.

[2] Estimate.

[3] Forecast.

[4] Value of all products and services sold by establishments in the sanitary paper products industry.

[5] Value of products classified in the sanitary paper products industry produced by all industries.

SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA). Estimates and forecasts by ITA.

ments has slowly declined during the past few years, as sales of disposable baby diapers, feminine hygiene products, and geriatric and other products have increased their relative market shares. In 1990, sanitary tissue product shipments included an estimated 10.5 billion rolls of bathroom tissue, of which over two-thirds were single-ply; 2.8 billion rolls of household toweling; and 192 billion two-ply facial tissues. Disposable baby diaper sales, which comprised about 26 percent of total shipments (value basis) in 1990, included an estimated 16.1 billion units; while feminine products totaled about 11.5 billion napkins and pads, and 5.4 billion tampons.

The industry's large proportion of nondiscretionary consumer-directed products has been a major source of its long-term growth and profitability. More recently, discretionary products such as geriatric and hospital-type paper products (including adult disposable diapers, liners, pads, and apparel) have become the growth leaders. In 1990, it is estimated that incontinence, health, and hospital-type disposable paper goods accounted for more than $550 million in combined sales, 20 percent more than the 1989 current dollar level, totaling about 1.5 billion units.

Competition for market share among brand name, generic, and private label products has been intense in recent years. Changes in the size, appearance, and texture of many sanitary paper products are frequent and heavily publicized. The industry has outspent all other domestic paper manufacturing sectors combined in advertising and promoting its products during the past several years. Although prices increased over the past few years (7 percent in 1990), there has been deep discounting on various product lines as profits were sacrificed to maintain market share.

The U.S. production of sanitary tissue stock, the sector's principal raw material, reached an estimated 5.7 million tons in 1990, up almost 2.5 percent from the 1989 level. Tissue producers operated at about 95 percent of capacity in 1990, down from an estimated 98 percent in 1989. Despite some yearly sales fluctuations, growth in domestic tissue output has been slow, partly because the major end-use markets, bathroom tissue and toweling, are at near saturation levels. In 1990, some sanitary tissue producers increased the proportion of recycled fiber in their tissue paper, and publicized the fact in response to environmental concerns and public preference.

Disposable Diapers

Disposable baby diapers regained some of their earlier growth momentum. The number of units sold increased 3 percent during the past two years, after a relatively flat sales period that began in 1985—the end of the most recent baby boom. The small but real growth in this sector only served to sharpen competition for market share among the three major producers, which account for about 90 percent of the entire U.S. disposable baby diaper market. This intense competition has spawned technological improvements in the design, construction, absorbency, quality, and appearance of the baby diaper. Although sales of new diaper products have increased, they did so at the expense of other diapers within the same manufacturer's product line. In 1990, the top diaper producers further expanded some of their recent product offering by including disposable training pants and diapers especially designed to fit each gender.

The nonbiodegradability of the disposable baby diapers became a more visible issue in 1990 as environmental groups focused on the problem these diapers cause in municipal landfills. The growing environmental fervor was utilized to advantage by cloth diaper manufacturers and diaper services, which had seen its share of the baby diaper market shrink from 100 percent before 1961 (the year the disposable diaper was introduced) to 10 to 15 percent in 1990. As a result, there was renewed interest in reusable cloth diapers, and diaper services reported sharply increased orders and inquiries concerning their product.

Tampons

The major domestic consumer shift back to sanitary napkins and pads from tampons in the early 1980s, as a result of the toxic shock syndrome, continued into 1990. Napkins and pads retained about 65 percent of total feminine hygiene product sales in that year. At the end of 1989, the FDA released final rules that require tampon manufacturers to label their products to reflect newly adopted standardized terms to describe tampon absorbency, a characteristic associated with toxic shock syndrome. Tampon producers were required to adhere to the new FDA guidelines by March 1, 1990.

Exports of sanitary paper products, account for about 2 percent of product shipments. Shipments were estimated to have climbed sharply in both tonnage and value in 1990, up about 10 percent and 47 percent, respectively, over 1989 levels. An estimated 130,000 tons of sanitary paper goods were exported, mostly to Mexico and Canada. Imports of sanitary paper products in 1990—mostly from Mexico, Canada, and the Dominican Republic—were estimated at about 75,000 tons, a sharp drop from the 1989 level. Major imports included toilet tissue and disposable medical and hospital supplies, while principal exports included paper towels, baby diapers, and disposable medical and hospital supplies.

Outlook for 1991

The value of shipments of sanitary paper products in 1987 dollars is projected to increase about 2.5 percent in 1991, about the same rate of increase as in 1990. The fastest growth area will continue to be geriatric-type disposable goods. Tissue products, disposable baby diapers, and feminine hygiene products will approximate their more moderate 1990 rate of growth. Recyclability and biodegradability will continue to be important issues in 1991, with emphasis on increasing the waste fiber content in the sanitary tissue products. Further studies will be made on improving the recyclability of disposable baby diapers and developing a truly biodegradable product.

Long-Term Prospects

Shipments of sanitary paper products are forecast to rise about 2.8 percent annually during the 1991-95 period. Domestic and foreign markets for more sophisticated, higher value disposable diapers and other personal medical and hospital disposable paper goods will likely show the fastest growth. "His and her" baby diapers and training pants will continue to expand their market niche. At the same time, research on creating a more absorbent, thinner baby diaper will continue. The goal being the production of a less bulky product that consumes less fluff pulp, the relatively costly raw material used in manufacturing disposable diapers. Limited supplies of the chemicals used to manufacture superabsorbent polymers may limit the availability of products dependent on them. Manufacturers may limit the use of those substances in personal hygiene products due to the relationship found between toxic shock syndrome and the use of high-absorbency tampons.

HUGGIES
48
HUGGIES
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Shipments in the sanitary paper products industry sector achieved a 2.5 percent rate of growth in 1990, continuing as one of the most dynamic sectors in paper manufacturing.

Pressure will mount for the development of environmentally acceptable methods for disposing of or recycling baby diapers. The leading disposable diapers producers will likely introduce what will be claimed as an environmentally friendly diaper—either totally or partly biodegradable. New technology will be developed to more efficiently collect, dispose, or recycle the diaper product.

Foreign trade in sanitary paper products will continue to expand, and imports will probably equal exports by 1992. Markets for sanitary tissue and other sanitary products will likely expand in Latin America and the Pacific Rim, as well as in Canada, while suppliers in Mexico and the Caribbean region will increase their tissue product sales to the United States.—*Leonard S. Smith, Office of Forest Products and Domestic Construction, (202) 377-0375, September 1990.*

FLEXIBLE PACKAGING MATERIALS

This new packaging category, created for the *1991 U.S. Industrial Outlook*, comprises SIC 2671 (Packaging Paper and Plastics Film, Coated and Laminated); SIC 2673 (Plastics, Foil, and Coated Paper Bags); and SIC 2674 (Uncoated Paper and Multiwall Bags). This flexible packaging materials grouping includes wrapping materials in single or multiple web forms, made of combinations of laminates of paper, plastic film, metal foil, and similar materials (excluding textiles); and also includes coated and uncoated bags and sacks made from those same materials. Under the 1987 revision of the SIC system, the products grouped in this flexible packaging materials category were formerly a segment of SIC 2641 (Paper Coating and Glazing) and all of SIC 2643 (Bags, Except Textile Bags). This section presents Department of Commerce data on the three flexible packaging industries when appropriate, and will generally treat each sector on an individual basis, while recognizing their commonality.

The value of shipments of packaging paper and plastics film (SIC 2671) was estimated to have increased by about 1.5 percent,in real terms, in 1990. The recent growth in the plastics packaging film segment of this industry has been the driving force in its overall sales growth over the past several years, accounting for almost 80 percent of the 1990 value of shipments, compared to about 60 percent in 1982.

Two major commodity groups within this sector are responsible for more then 70 percent of the industry's sales. They include multiweb laminated rolls and sheets of plastic film, and single web plastic film. Multiweb films are used to package cigarette cartons and packs, snacks and dry foods, pet foods, sandwiches, dairy products, frozen foods, and other products that require protection from moisture and temperature changes. The rapidly increasing number of end-uses for multiweb films, especially plastic-to-plastic laminations, is responsible for rapid growth for this industry over the past several years.

Shrink and Stretch Film

Single web films, in coated rolls and sheets, consist primarily of shrink and stretch films, which represent the fastest

Trends and Forecasts: Flexible Packaging Materials (SIC 2671,2673,2674)

(in millions of dollars except as noted)

Item	1987	1988[1]	1989[2]	1990[2]	1991[3]	Percent Change 1987-88	1988-89	1989-90	1990-91
Industry Data									
Value of shipments[4]	9,441	10,554	11,544	11,703	—	11.8	9.4	1.4	—
2671 Paper pkg coated/lam	2,416	2,609	2,835	2,896	—	8.0	8.7	2.2	—
2673 Bags: plastics/coated	4,577	5,213	5,683	5,598	—	13.9	9.0	−1.5	—
2674 Bags: uncoated	2,448	2,732	3,026	3,207	—	11.6	10.8	6.0	—
Value of shipments (1987$)	9,441	9,531	9,616	9,698	9,805	1.0	0.9	0.9	1.1
2671 Paper pkg coated/lam	2,416	2,449	2,485	2,520	2,560	1.4	1.5	1.4	1.6
2673 Bags: plastics/coated	4,577	4,635	4,681	4,728	4,775	1.3	1.0	1.0	1.0
2674 Bags: uncoated	2,448	2,447	2,450	2,450	2,470	−0.0	0.1	0.0	0.8
Total employment (000)	68.7	69.5	69.9	70.1	70.6	1.2	0.6	0.3	0.7
2671 Paper pkg coated/lam	15.0	15.3	15.4	15.4	15.5	2.0	0.7	0.0	0.6
2673 Bags: plastics/coated	36.6	37.1	37.5	37.7	38.0	1.4	1.1	0.5	0.8
2674 Bags: uncoated	17.1	17.1	17.0	17.0	17.1	0.0	−0.6	0.0	0.6
Production workers (000)	53.7	55.3	55.7	55.9	56.4	3.0	0.7	0.4	0.9
2671 Paper pkg coated/lam	10.4	10.8	10.9	10.9	11.0	3.8	0.9	0.0	0.9
2673 Bags: plastics/coated	29.0	30.0	30.4	30.6	30.9	3.4	1.3	0.7	1.0
2674 Bags: uncoated	14.3	14.5	14.4	14.4	14.5	1.4	−0.7	0.0	0.7
Average hourly earnings ($)	9.58	9.74	10.03	10.33	—	1.7	3.0	3.0	—
2671 Paper pkg coated/lam	11.53	11.63	11.90	12.20	—	0.9	2.3	2.5	—
2673 Bags: plastics/coated	9.07	9.14	9.28	9.45	—	0.8	1.5	1.8	—
2674 Bags: uncoated	9.14	9.52	9.81	10.10	—	4.2	3.0	3.0	—
Capital expenditures	374	375	—	—	—	0.3	—	—	—
2671 Paper pkg coated/lam	128	85.0	—	—	—	−33.6	—	—	—
2673 Bags: plastics/coated	199	203	—	—	—	2.0	—	—	—
2674 Bags: uncoated	46.2	87.4	—	—	—	89.2	—	—	—
Product Data									
Value of shipments[5]	8,757	9,975	10,958	11,119	—	13.9	9.9	1.5	—
2671 Paper pkg coated/lam	2,460	2,740	2,978	3,048	—	11.4	8.7	2.4	—
2673 Bags: plastics/coated	3,937	4,646	5,166	5,139	—	18.0	11.2	−0.5	—
2674 Bags: uncoated	2,361	2,589	2,815	2,932	—	9.7	8.7	4.2	—
Value of shipments (1987$)	8,757	9,021	9,144	9,231	9,346	3.0	1.4	1.0	1.2
2671 Paper pkg coated/lam	2,460	2,572	2,610	2,650	2,690	4.6	1.5	1.5	1.5
2673 Bags: plastics/coated	3,937	4,131	4,255	4,340	4,449	4.9	3.0	2.0	2.5
2674 Bags: uncoated	2,361	2,319	2,279	2,240	2,207	−1.8	−1.7	−1.7	−1.5

[1] Advance data from the 1988 Annual Survey of Manufactures.

[2] Estimate.

[3] Forecast.

[4] Value of all products and services sold by establishments in the flexible packaging materials industry group.

[5] Value of products classified in the flexible packaging materials industry group produced by all industries.

SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA). Estimates and forecasts by ITA.

growing industry commodity. These coated films are generally used to palletize and wrap corrugated boxes and other shipping containers, applications that require product protection and maintenance of the integrity of the bundled products.

Over the past few years, shrink and stretch films have penetrated into the corrugated shipping container area, but still account for a relatively small portion of that very large market. Nevertheless, the recent increase in the use of these coated single-web packaging mediums for items such as lumber, mail, firewood, paper roll stock, toys, and pharmaceuticals, has displaced more traditional wrappings such as rope, twine, metal strapping, tape, and string.

Although both shrink and stretch films have similar applications, they differ in manufacture, method of use, and product characteristics. Shrink films are prestretched and are heated to closely adhere to the item being packaged, such as beverage bottles and cans. Stretch film competes directly with shrink film, and does not require the additional equipment and energy needed to apply the latter. Stretch film can tightly wrap a crate, bundle, pallet, or stack, forming a protective barrier that bonds to the product by surface tension. It has less moisture and puncture resistance than shrink film, but it can be more easily applied, either manually or through a conveyor-type operation, and is generally about one-third as costly as shrink film.

Paper and Plastic Bags

In 1990, the combined real value of shipments of paper and plastic bags (SIC 2673 and 2674) gained an estimated 1 percent, spurred by moderate sales growth of plastic bags in SIC 2673 (up about 2 percent) and despite a similar decline in uncoated paper bags and multiwall shipping sacks and bags. Plastic bags comprised more than 60 percent of the combined value of shipments of the two bag industries in 1990. This product sector consists primarily of specialty bags and liners constructed of polyethylene and other plastic films, which together account for almost 75 percent of the current value of its shipments.

Plastic bags and liners supplied about 60 percent of the current value of combined paper and plastic bag shipments estimated for 1990, while paper bags and sacks and small quantities of foil bags accounted for the remainder. The proportion of plastic to paper in total bag and liner shipments had been shifting dramatically toward plastics for more than 15 years, a swing that has slowed significantly during the past two years under environmentally targeted legislation designed to eliminate or sharply curtail sales of plastic packaging.

Markets in which plastic films have gained dominance over paper include variety merchandise, refuse bags, produce, textiles and apparel, and household food storage.

Paper still dominates the grocery bag and sack market, but plastics have made deep inroads, especially in larger retail grocery chain stores. Many supermarket chains still offer both paper and plastic bagging at their checkout counters, partly under pressure from environmental groups, and legislation. Industry sources estimate that paper still held almost two-thirds of the 30-billion unit grocery bag market in 1990, almost the same proportion as in 1989, due to its environmental and economic advantages.

The domestic production of unbleached kraft paper was expected to continue its long downslide, totaling about 2.4 million tons in 1990, about 10 percent below the 1989 level of output. About 60 percent of the production of this material goes into bags and sacks, another 25 percent is used in multiwall shipping sacks, and the remainder is used for wrapping and other converting purposes. Some of the apparent decline in kraft wrapping paper production may have been due to the shifting of some production capacity to kraft linerboard, which has been in greater demand both domestically and for export during the past several years.

A number of factors have contributed to the rapid influx of plastic packaging films, bags, and liners into markets previously dominated by paper. Lower cost is a consideration, but flexible plastic materials also have the advantages of convenience in storage capability, superior moisture resistance, reusability, strength, and easy printability. The strength and durability of plastic packaging have environmental disadvantages, however, and numerous efforts are underway to eliminate these bags from the retail market or, at the least, develop better disposal and collection methods. In 1990, the plastic film industry accelerated its efforts to develop and market plastic packaging that will self-destruct, either by biodegradation, photodegradation, or other means.

Trade

In recent years, the United States has had a foreign trade deficit in flexible packaging materials, especially plastic bags. Nevertheless, based on incomplete 1990 data, an estimated 43,000 tons of plastic sacks and bags, valued at about $132 million, were exported, up sharply from 1989 levels. Principal markets included Mexico and Canada. Paper bag and sack exports were estimated to have totaled about 40,000 tons, valued at $47 million, considerably higher than 1989 levels. Principal bag and sack markets were Canada and Mexico. Part of the growth in exports may be attributable to more complete reporting of U.S. exports to Canada (See "How to Get the Most Out of This Book" for an explanation of the reporting change). The combined imports of plastic and paper bags climbed about 8 percent in value in 1990. Plastic bag imports totaled an estimated 135,000 tons, while purchases of paper bags and multiwall sacks totaled an estimated 20,000 tons. Principal suppliers of plastic bags included Taiwan, Canada, West Germany, Sweden, and the People's Republic of China. Canada, Mexico, and South Korea were the principal suppliers of paper bags and sacks.

Outlook for 1991

The value of shipments of packaging paper and plastic film is projected to increase about 1.2 percent in 1991, about the same rate as in 1990. Continued growth in this industry will be spurred by increasing use of shrink and stretch films, instead of corrugated shipping containers. Shipments of coated bag products categorized under SIC 2673 are forecast to increase by 2.5 percent in 1991, a higher rate of growth than in 1990. Industry growth was led by sales of coated plastic bags, which will probably show a small real-term sales gain because of increasing pressure to restrict their use from environmental and legislative groups. The volume of paper bag shipments will continue to decline, but the slide will moderate to some extent (down 1.5 percent in 1991 compared to 2 percent in 1990). Paper packaging will regain a small portion of its lost market share as a result of public preference for the more biodegradable, recyclable, paper medium.

Long-Term Prospects

Over the 1991-95 period, shipments of packaging paper and plastics films are projected to increase at about 2.5 percent a year. The fastest growth will be in coated single-web packaging film, especially shrink and stretch wraps. Because stretch film is less expensive, it will likely surpass shrink film in usage. A significant turnaround is forecast in the growth patterns for packaging paper and plastic film, as well as bag products. Although plastics are still likely to account for the largest proportion of flexible packaging material shipments by 1995, they will lose a significant share to more environmentally acceptable paper, in both wrappers and bag form. The plastic film product mix will shift and consist of a much larger percentage of what the plastics industry currently identifies as biodegradable plastic products over the five-year period. This definition will be increasingly challenged as to its authenticity, in both public and scientific forums. A recent industry study estimates that by 1994, sales of degradable plastic films will exceed $300 million and could reach $1.8 billion.

As a result of this expected swing back to more environmentally friendly packaging products, shipments of plastics, foil, and coated paper bags (mostly plastic-based) will experience a period of constrained growth of about 1.5 to 2 percent annually during 1991-95. Shipments of uncoated paper bags and sacks will pick up the slack, ending their sustained slide of the past several years. Paper-based packaging shipments are projected to be level or to grow less than 1 percent over the five-year period. A similar projection applies to uncoated paper and multiwall bag shipments during 1991-95.

Increasing legislative and consumer pressures to promote a cleaner, safer environment are expected to occur both in the United States and in other developed nations over the next few years. It is estimated that U.S. exports of flexible packaging materials will show a greater proportion of paper products being shipped to those regions, while plastic film products will be directed to the lesser developed countries, where regulations concerning the use of such packaging materials are less stringent or nonexistent.—*Leonard S. Smith, Office of Forest Products and Domestic Construction, (202) 377-0375, September 1990.*

PAPER COATING AND LAMINATING

In 1990, U.S. manufacturers of nonpackaging coated and laminated paper products (SIC 2672) enjoyed their fifth consecutive year of strong growth, as the constant dollar value of product shipments increased 3.5 percent. Because this industry produces many industrial, retail, and consumer products, its growth is closely linked to that of the economy at large. Over the past five years, however, this industry's real growth has far exceeded that of real GNP growth. An expanding U.S. economy, a stable U.S. dollar, and strong foreign demand have contributed to increased domestic and export sales for this industry last year. Establishments in this industry produce coated, laminated, or processed paper and films for applications other than for packaging. Also included in this industry sector are those manufacturers and converters that produce off-machine coated and gummed paper products and pressure-sensitive paper and tape with any backing except for rubber.

Pressure-sensitive products are the leading output of this industry, accounting for more than 60 percent of the value of all its sales in 1990, amounting to $4.48 billion. Pressure-sensitive products include pressure-sensitive paper (for unprinted labels), sheets, strips, tapes, and all unprinted pressure-sensitive base stock. Tapes provided about 70 percent (or $3.14 billion) of the total value of all pressure-sensitive products shipments last year.

The United States is the world's leading producer of pressure-sensitive tapes, manufacturing many varieties of single-faced tapes (including paper, film, foil, masking, and woven and nonwoven fabrics tapes) and double-faced tapes. The largest and fastest growing market for these tapes is forming and sealing corrugated boxes and other shipping containers. Pressure-sensitive tapes have a number of advantages over the other two methods of case sealing (hot-melt and cold-press adhesives). These include ease of operation, convenience, application at high speeds, lower equipment requirements, and lower energy and chemical requirements.

The single-faced pressure-sensitive tape used to form, protect, and seal boxes, cartons, and containers may be paper-backed, plastic- and plastic film-backed, or cloth backed. Tapes with plastic and plastic film backings accounted for about 55 percent of all pressure-sensitive tape shipments in 1990 and exhibited the highest rate of growth last year. Paper-backed tapes hold about 35 percent of the market, and cloth-backed tapes, the remaining 10 percent.

An alternative tape for use in shipping and packaging is the more traditional water-activated gummed tape. Gummed tape has several advantages over its pressure-sensitive counterpart, including secure closure, lengthy storage capabilities, remoistenable adhesives, dust protection, and recyclability. Pressure-sensitive tapes are known for their high-speed operation and application, lower energy, equipment, and chemical costs, and ease of portability. The increased use of pressure-sensitive tapes over the past decade has been at the expense of the gummed tape products, which historically have dominated the shipping/packaging market.

The current-dollar value of shipments of gummed products has fluctuated over the past five years, but in 1990 it equaled its all-time high of about $290 million. The gummed products sector primarily produces packaging materials such as gummed sealing tape, corrugator's box tape, and gummed postage and stock labels. Sales of gummed sealing tape accounted for nearly 60 percent of all gummed products shipments last year.

In 1990, sales of unprinted pressure-sensitive paper, labels, and label base stock (also referred to as self-adhesive labeling) were valued at $1.34 billion and accounted for nearly 30 percent of all pressure-sensitive materials sales. The packaging sector is the largest consumer of pressure-sensitive labels. The use of these labels has increased dramatically during the past eight years, often replacing wet-glue labels and water-activated labels, which require additional equipment, processing time, and energy. Much of the success of pressure-sensitive labels has been the result of plastic containers displacing glass and composite materials. A large variety of adhesive capabilities has positioned pressure-sensitive labels favorably against both wet-glue and water-activated labels for use in decorating plastic substrates (ketchup, margarine and other squeezable containers). The use of pressure-sensitive labels is also encouraged by the greater degree of segmentation by consumer-goods companies. Pressure-sensitive labels will continue to be well suited for applications geared toward specific end-user groups and frequent market tests, as well as for glass bottles and jars and other food packages, tubes, tubs, boxes and containers.

New Technology

Technological advances and new processing and product adaptations have improved operating efficiencies in label application, die-cutting, coating, printing, and fastening/transferring. These improvements have led to broader

Trends and Forecasts: Paper Coated and Laminated, NEC (SIC 2672)

(in millions of dollars except as noted)

Item	1987	1988[1]	1989[2]	1990[2]	1991[3]	Percent Change			
						1987-88	1988-89	1989-90	1990-91
Industry Data									
Value of shipments[4]	5,892	6,801	7,500	7,894	—	15.4	10.3	5.3	—
Value of shipments (1987$)	5,892	6,441	6,720	6,955	7,233	9.3	4.3	3.5	4.0
Total employment (000)	30.9	32.4	32.8	33.0	33.2	4.9	1.2	0.6	0.6
Production workers (000)	21.1	22.5	22.8	23.0	23.0	6.6	1.3	0.9	0.0
Average hourly earnings ($)	11.55	11.49	11.85	12.22	—	−0.5	3.1	3.1	—
Capital expenditures	201	196	—	—	—	−2.5	—	—	—
Product Data									
Value of shipments[5]	5,498	6,232	6,870	7,232	—	13.4	10.2	5.3	—
Value of shipments (1987$)	5,498	5,902	6,156	6,372	6,626	7.3	4.3	3.5	4.0

[1] Advance data from the 1988 Annual Survey of Manufactures.

[2] Estimate.

[3] Forecast.

[4] Value of all products and services sold by establishments in the paper coated and laminated, nec industry.

[5] Value of products classified in the paper coated and laminated, nec industry produced by all industries.

SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA). Estimates and forecasts by ITA.

markets for pressure-sensitive labels, and, since 1982, this sector has expanded at a rate of more than 10 percent a year. One of the fastest growing end-use applications for pressure-sensitive labels is in Universal Product Code (UPC) labeling and bar-code labeling systems. UPC labels are now used by grocery and department stores and many other retail sales operations utilizing high-speed product spanning equipment.

Driven by retail, wholesale, and manufacturering demand for increased productivity and improved operating efficiencies, bar-code labeling has been implemented for creating production lists and data entry systems, tracking and locating specific products and shipments, monitoring physical inventory, and categorizing new orders and completed receipts. Innovative procedures for using UPC labels are now being utilized by hospitals, pharmaceutical companies, automobile parts suppliers, business and home computer firms, and video cassette rental stores, thus creating a strong demand for pressure-sensitive labels.

International Trade

International trade in nonpackaging coated and laminated paper products, especially pressure-sensitive materials, has grown substantially and become increasingly competitive in recent years. Exports, which consisted primarily of pressure-sensitive materials, gummed products, and coated adhesive paper, increased by 4 percent in value in 1990. Principal export markets for this industry's high value-added products last year were Canada, Mexico, the Netherlands, Japan, and South Korea. In 1990, U.S. imports of these commodities were up 3 percent from the 1989 level, and were dominated by sales of pressure-sensitive plastic tapes, which accounted for almost 52 percent of all industry imports. Other imports included rolls of electrical tape (10.5 percent), cut-to-size articles of coated paper and paperboard (9 percent), and rolls and strips of pressure-sensitive gummed/adhesive paper (7.5 percent). The leading suppliers were Canada, Switzerland, Japan, and West Germany.

Outlook for 1991

After a strong sales performance last year, the nonpackaging coated and laminated paper products industry should expand further in 1991 as established markets experience growth and new end-use applications are developed, especially for pressure-sensitive tapes and labels. The inflation-adjusted value of product shipments should increase 4 percent, surpassing GNP growth. International trade in these commodities will also increase; exports will rise by 6 percent and imports by 4 percent.

Long-Term Prospects

During the 1991-95 forecast period, shipments of nonpackaging coated and laminated paper products are forecast to increase 3.5 percent per year. Because pressure-sensitive tapes and labels are rapidly becoming the most popular and widely accepted materials for their specific end-uses, this industry will experience strong sales for at least the next five years. Competition between pressure-sensitive products and wet-glue and water-activated gummed packaging materials should increase as both sectors attempt to maintain current market share and develop new commercial, industrial, wholesale, and retail applications. However, it is estimated that pressure-sensitive materials will continue to erode the market share of the other materials.

Effect of Environmental Issues

This industry will be closely monitoring the recyclability and biodegradability of its major product lines over the next five years. Environmental pressures concerning the growing problems of domestic municipal solid waste and shrinking landfill capacity will have a definite impact on domestic converters of nonpackaging coated and laminated paper products. As their customers demand that converters take a more active role in the area of solid waste management and the promotion of commodities containing recycled fibers, manufacturers will develop new, recycled/recyclable materials. Converters will have to work very closely with producers of adhesives, glues and inks to ensure that the industry's commodities, especially the gummed and pressure-sensitive tapes and labels, are integrated into today's recycling processes. Many of today's tapes and labels utilize a form of adhesive or glue that is not water soluble and therefore prevents or limits its recyclability. Future adhesive development will likely focus on specialty applications in response to specific market opportunities and to better compete against alternative packaging, sealing, and decorating methods. These specialty application methods will include wet-stick, wash-away, repositionable, and hot-fill adhesives.

The use of pressure-sensitive tapes in carton sealing and packaging will continue to expand because of their convenience, ease, speed of application, and their performance characteristics. Transparent plastic and film-backed tapes will experience the strongest growth. Additional markets for pressure-sensitive tapes, including fasteners for baby diapers, tapes for decorative and insulative purposes, and easy-open tapes on canned juices and noncarbonated liquids, will increase domestic and international demand.

The growth of exports and imports will accelerate during the forecast period as domestic and foreign converters find new overseas markets and develop new product niches for pressure-sensitive materials. Improvements in production and processing technologies will be essential to keep operating, material, and energy costs down.

The present trend toward industry consolidation through company buyouts, mergers, takeovers, and acquisitions is likely to continue during the next five years as companies attempt to further concentrate sales and stabilize earnings to accomodate the cyclical sensitivity of the primary paper and paperboard producing sector to the cyclical changes in demand for coated and laminated products.—*Gary L. Stanley, Office of Forest Products and Domestic Construction, (202) 377-0375, September 1990.*

ENVELOPES

Following a disappointing sales performance in 1989, U.S. envelope manufacturers (SIC 2677) experienced increased domestic and foreign demand and higher sales in 1990. Product shipments of all types of envelopes increased 2.0 percent last year, paralleling the growth of GNP and slightly exceeding gains in general U.S. business activity

Trends and Forecasts: Envelopes (SIC 2677)

(in millions of dollars except as noted)

Item	1987	1988[1]	1989[2]	1990[2]	1991[3]	Percent Change 1987-88	1988-89	1989-90	1990-91
Industry Data									
Value of shipments[4]	2,598	2,936	3,150	3,200	—	13.0	7.3	1.6	—
Value of shipments (1987$)	2,598	2,766	2,751	2,807	2,877	6.5	−0.5	2.0	2.5
Total employment (000)	27.6	28.3	28.3	28.4	28.5	2.5	0.0	0.4	0.4
Production workers (000)	20.8	21.4	21.4	21.5	21.5	2.9	0.0	0.5	0.0
Average hourly earnings ($)	9.39	9.73	10.04	10.35	—	3.6	3.2	3.1	—
Capital expenditures	61.3	72.1	—	—	—	17.6	—	—	—
Product Data									
Value of shipments[5]	2,500	2,805	3,010	3,057	—	12.2	7.3	1.6	—
Value of shipments (1987$)	2,500	2,642	2,629	2,682	2,748	5.7	−0.5	2.0	2.5

[1] Advance data from the 1988 Annual Survey of Manufactures.

[2] Estimate.

[3] Forecast.

[4] Value of all products and services sold by establishments in the envelopes industry.

[5] Value of products classified in the envelopes industry produced by all industries.

SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA). Estimates and forecasts by ITA.

and consumer disposable income. Sales of envelopes rose last year despite increased use of facsimile machines, electronic mail transfer and message systems, and other electronic hardcopy transfer systems, as well as consumer resistance to third-class direct-mail advertising and high domestic postal and shipping rates. Domestic producers of envelopes lost sales when some of their largest end-users (i.e., banks, insurance companies, and other finanical institutions) switched to electronic wire information exchange services, electronic funds transfer operations, and the Electronic Data Interchange (EDI) system.

The U.S. envelope industry manufactures a wide range of products made from a variety of raw materials; including paper, plastic and plastic resins, nylon, and paper/plastic laminations. Manufactured envelopes are of three basic types: white, kraft (or brown), and colored commercial and business stationery envelopes (manufactured primarily from bleached, unbleached, and colored uncoated free sheet base stock); heavy-duty padded shipping envelopes and mailers; and clasp and string-and-button envelopes.

Direct-Mail and Industry Growth

In 1990, 71 percent of the industry's envelope shipments were business and commercial stationery envelopes, which were valued at $2.17 billion. One of the leading uses for these envelopes is in direct-mail advertising, which continues to show strong growth. Despite much consumer opposition to this form of advertising and high domestic postal rates, direct-mail remains competitive with other promotional activities. One of the leading reasons for the popularity of third-class mail advertising is that it effectively puts manufacturers' product descriptions, coupons, or other promotional literature directly into consumers' hands. It also allows companies to target discrete market segments better than does the use of newspapers, magazines, radio, television, or other mass media. Although third class mail volume has traditionally declined or leveled off immediately after a postal rate hike before returning to a positive growth pattern about six months later, its volume has remained essentially level since the April 1988 postage rate increase.

Plastic Film Envelopes

Because of higher mailing and shipping costs resulting from postal rate increases, many envelope users are looking for envelopes which are stronger and lighter. This has led to higher sales of both plastic film and Tyvek (or spunbonded olefin) envelopes over the past five years. These product lines offer a variety of advantages over traditional paper envelopes, including better water, moisture, and chemical resistance; high physical strength properties; tamper evidence; a bright surface finish for easy printability; and reduced weight (contributing to lower overall shipping costs). Tyvek envelopes have made significant inroads in the paper envelope end-user market, including overnight express mail and delivery services, floppy disk sleeves, coin and booklet envelopes, and interoffice/interplant correspondence.

Sales of heavy-duty and padded shipping envelopes were valued at $520 million in 1990 and accounted for 17 percent of all U.S. envelope sales. These more expensive and heavier envelopes are used by the mail-order industry, for parcel post and other commercial or consumer applications that require strong, durable, protective, cushioned envelopes. These envelopes are available in a wide range of sizes and shapes and are constructed from a variety of base materials, including paper, plastic, latex, plastic resins, or similar substances. The cushioning material usually consists of shredded or macerated scrap paper and paperboard, plastic air bubble cushioning, nylon, foam rubber, or plastic. It protects the envelope contents from damage during shipping and handling. Cushioned or padded envelopes are primarily of a single, open-end construction and can be rapidly filled and sealed (by stapling, taping, or tear perforation).

The continued growth of "shop-at-home" services and the direct mail order industry have contributed to strong growth in shipping envelopes since the mid-1980s. With more and more U.S. households becoming two income families, there has been a wider acceptance of toll-free telephone shopping, credit card phone and charge networks, and direct-mail advertisement and product solicitation. This trend continued in 1990 and contributed to higher sales of padded shippers and mailers. The two envelope types that have experienced the strongest growth over the past several years have been the kraft paper envelope lined with macerated waste paper and board and the kraft paper envelope lined with polyethylene bubble cushioning.

Clasp and string-and-button envelope sales last year were valued at $308 million and accounted for 10 percent of the value of all envelope shipments. These durable envelopes can be opened and closed many times and are widely used by Federal and state government agencies, banks, insurance firms, retail outlets, investment firms, and other business firms for either in-house mailing or filing purposes.

Trade Competition

International trade in the envelope industry is still small, but it has expanded during the past several years. U.S. envelope exports increased 87 percent in 1990. Primary U.S. export markets last year were Canada (70 percent), Mexico (7 percent), West Germany (6 percent), and the United Kingdom (6 percent). Part of the export expansion may be due to more complete reporting of exports to Canada. (See "How to Get the Most Out of This Book" for an explanation of this reporting change.) U.S. imports of envelopes fell nearly 6 percent in 1990. Major U.S. envelope suppliers include Canada (38 percent), Mexico (12 percent), West Germany (11 percent), Israel (8 percent), and Sweden (7 percent). The gradual removal of all tariff barriers between the United States and Canada under the 1989 U.S.-Canada Free Trade Agreement (FTA) has opened up a number of trading opportunities for U.S. envelope manufacturers. Since 1988, U.S. envelope shipments to Canada have increased more than 250 percent. The ability of the U.S. envelope converters to offer a wide range of envelope shapes, sizes, and base materials, in combination with a lower valued U.S. dollar, has also improved the U.S. envelope industry's trade performance over the past several years.

Outlook for 1991

The U.S. envelope industry should continue its expansion in 1991 with a 2.5 percent increase in the value of product shipments. This forecast is dependent upon continued expansion of U.S. business activity leading to increases in consumer disposable income, which is expected to lead to increases in third-class direct-mail advertising. Manufacturers of envelopes constructed of paper, plastic, and spunbonded olefin base materials will intensify their efforts to gain market share in both standard and specialty envelope categories. Exports and imports, while still relatively small, should increase 6.4 percent and 2.1 percent, respectively.

A postage rate increase is likely early in 1991, but it is not expected to have a prolonged negative impact on sales of envelopes. Envelope sales may slow in the first half of the year, but should rebound moderately in the second half.

Long-Term Prospects

Domestic product shipments of envelopes should continue to grow over the 1991-95 forecast period at a rate of 2.5 percent (in real terms) per year as established markets expand and new end-use applications and product lines develop. The standard business envelope segment of the domestic envelope industry is recognized as a mature market; therefore, future growth will depend upon expansion of the specialty envelope sector. The U.S. envelope industry in recent years has developed unique products designed to fit customer specifications utilizing unique shapes, sizes, and new base construction materials. Competition among manufacturers of paper, plastic, nylon, and spunbonded olefin envelopes will continue to intensify as each sector attempts to protect its market share and expand into new areas. Envelope manufacturers will promote their distinct characteristics and advantages of their specific products in an attempt to secure new end-users.

Environmental pressures concerning the growing problems of domestic municipal solid waste (MSW) and shrinking landfill capacity will have a definite impact on domestic manufacturers and converters of envelopes. As their customers demand that envelope producers take a more active role in the area of MSW management, manufacturers will develop and promote the use of new recycled/recyclable envelopes and mailers. Over the past couple of years, domestic converters have noted an increase in demand for certain types of envelopes containing recycled or recyclable fibers, including padded shipping envelopes lined with shredded waste paper and board. This trend will likely continue throughout the forecast period. The minimum fiber content guidelines developed by the U.S. Environmental Protection Agency currently require, to the extent possible, that envelopes contain at least 50 percent recycled fiber (both preconsumer and postconsumer). In an attempt to reduce the volume of paper in domestic MSW, stricter guidelines on minimum secondary fiber content are expected.

Also, competition from alternate sources of communication and information transfer is expected throughout the forecast period. The utilization of facsimile machines and other hard copy transfer systems will eliminate some domestic envelope sales. Despite these pressures, the envelope industry [illegible] experience overall growth if the economy remains healthy.—*Gary L. Stanley, Office of Forest Products and Domestic Construction, (202) 377-0375, September 1990.*

OTHER CONVERTED PAPER AND BOARD PRODUCTS

This diverse group of paper and board converting industries includes: Sanitary Food Containers (SIC 2656); Set-up Paperboard Boxes (SIC 2652); Fiber Cans, Tubes, Drums, and Similar Products (SIC 2655); Die-cut Paper and Paperboard (SIC 2675); Stationery Products (SIC 2678); and Converted Paper Products, not elsewhere classified (SIC 2679). In the *1991 U.S. Industrial Outlook*, the narrative sections on these six relatively small paper converting sectors have been dropped, because of the lack of uniform, reliable, and current industry data. However, in order to maintain full Paper and Allied Products (SIC 26) coverage, a trends and forecast table for these industries is presented. Projections were made based on the most recent Bureau of the Census data (1988). Detailed background data on these individual converting industries can be found in the 1990 and earlier editions of the *U.S. Industrial Outlook* in the chapter on Paper and Allied Products.—*Leonard S. Smith, Office of Forest Products and Domestic Construction, (202) 377-0375, September 1990.*

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(Call the Bureau of the Census at 301-763-4100 for information about how to order Census documents.)

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American Paper Maker, ASM Communications Inc., 6 Piedmont Center, Suite 300, 3525 Piedmont Road, Atlanta, GA 30305. Telephone: (404) 841-3333.

Board Converting News, NV Business Publishers Corp. South 105 Farview Avenue, Paramus, NJ 07652. Telephone: (201) 368-1225.

Boxboard Containers, Maclean Hunter Publishing Company 29 N. Wacker Drive, Chicago, IL 60606. Telephone: (312) 726-2802.

1989 Statistics of Paper, Paperboard, and Wood Pulp, American Paper Institute, 260 Madison Avenue, New York, NY 10016. Telephone: (212) 340-0630.

Nonwovens Industry, Rodman Publications Inc. 17 S. Franklin Turnpike, P.O. Box 555, Ramsey, NJ 07446. Telephone: (201) 825-2552.

Trends and Forecasts: Other Paper and Board Products (SIC 2652, 2655–6, 2675, 2678–9)

(in millions of dollars except as noted)

Item	1987	1988[1]	1989[2]	1990[2]	1991[3]	Percent Change 1987-88	1988-89	1989-90	1990-91
Industry Data									
Value of shipments[4]	10,592	11,916	12,680	12,906	—	12.5	6.4	1.8	—
2652 Setup paperboard boxes	437	438	460	476	—	0.2	5.0	3.5	—
2655 Fiber cans, drums, etc	1,537	1,631	1,763	1,905	—	6.1	8.1	8.1	—
2656 Sanitary food container	2,083	2,447	2,757	2,825	—	17.5	12.7	2.5	—
2675 Die-cut paper and board	1,749	1,917	2,000	2,000	—	9.6	4.3	0.0	—
2678 Stationery products	1,216	1,334	1,400	1,300	—	9.7	4.9	−7.1	—
2679 Paper products nec	3,570	4,150	4,300	4,400	—	16.2	3.6	2.3	—
Value of shipments (1987$)	10,592	11,321	11,262	11,347	11,531	6.9	−0.5	0.8	1.6
2652 Setup paperboard boxes	437	427	431	431	435	−2.3	0.9	0.0	0.9
2655 Fiber cans, drums, etc	1,537	1,533	1,555	1,555	1,575	−0.3	1.4	0.0	1.3
2656 Sanitary food container	2,083	2,333	2,356	2,368	2,403	12.0	1.0	0.5	1.5
2675 Die-cut paper and board	1,749	1,823	1,754	1,762	1,789	4.2	−3.8	0.5	1.5
2678 Stationery products	1,216	1,225	1,221	1,228	1,245	0.7	−0.3	0.6	1.4
2679 Paper products nec	3,570	3,980	3,945	4,004	4,084	11.5	−0.9	1.5	2.0
Total employment (000)	93.6	99.7	101	101	101	6.5	1.3	0.0	0.0
2652 Setup paperboard boxes	8.7	7.9	8.1	8.0	8.1	−9.2	2.5	−1.2	1.2
2655 Fiber cans, drums, etc	12.6	12.4	12.5	12.5	12.6	−1.6	0.8	0.0	0.8
2656 Sanitary food container	15.8	17.9	18.5	18.5	18.7	13.3	3.4	0.0	1.1
2675 Die-cut paper and board	15.7	16.8	16.6	16.8	16.9	7.0	−1.2	1.2	0.6
2678 Stationery products	11.2	13.2	13.3	13.2	13.2	17.9	0.8	−0.8	0.0
2679 Paper products nec	29.6	31.5	31.9	32.0	32.0	6.4	1.3	0.3	0.0
Production workers (000)	72.7	78.6	79.5	79.6	80.0	8.1	1.1	0.1	0.5
2652 Setup paperboard boxes	7.2	6.7	6.9	6.8	6.9	−6.9	3.0	−1.4	1.5
2655 Fiber cans, drums, etc	10.2	10.2	10.3	10.3	10.4	0.0	1.0	0.0	1.0
2656 Sanitary food container	12.8	14.6	15.0	15.0	15.2	14.1	2.7	0.0	1.3
2675 Die-cut paper and board	12.5	13.6	13.5	13.7	13.7	8.8	−0.7	1.5	0.0
2678 Stationery products	8.5	10.1	10.2	10.1	10.1	18.8	1.0	−1.0	0.0
2679 Paper products nec	21.5	23.4	23.6	23.7	23.7	8.8	0.9	0.4	0.0
Average hourly earnings ($)	8.67	8.77	—	—	—	1.2	—	—	—
2652 Setup paperboard boxes	6.36	6.10	6.22	6.30	—	−4.1	2.0	1.3	—
2655 Fiber cans, drums, etc	9.87	10.14	10.43	10.74	—	2.7	2.9	3.0	—
2656 Sanitary food container	9.83	10.16	10.50	10.85	—	3.4	3.3	3.3	—
2675 Die-cut paper and board	8.24	8.49	8.76	9.03	—	3.0	3.2	3.1	—
2678 Stationery products	8.25	7.96	8.12	8.30	—	−3.5	2.0	2.2	—
2679 Paper products nec	8.55	8.54	8.60	8.64	—	−0.1	0.7	0.5	—
Capital expenditures	273	263	—	—	—	−3.7	—	—	—
2652 Setup paperboard boxes	10.3	6.0	—	—	—	−41.7	—	—	—
2655 Fiber cans, drums, etc	34.0	26.3	—	—	—	−22.6	—	—	—
2656 Sanitary food container	95.5	85.2	—	—	—	−10.8	—	—	—
2675 Die-cut paper and board	33.4	43.5	—	—	—	30.2	—	—	—
2678 Stationery products	25.1	21.4	—	—	—	−14.7	—	—	—
2679 Paper products nec	74.5	81.1	—	—	—	8.9	—	—	—
Product Data									
Value of shipments[5]	10,176	11,237	11,951	12,173	—	10.4	6.4	1.9	—
2652 Setup paperboard boxes	518	494	519	536	—	−4.6	5.1	3.3	—
2655 Fiber cans, drums, etc	1,495	1,594	1,718	1,862	—	6.6	7.8	8.4	—
2656 Sanitary food container	1,960	2,221	2,503	2,565	—	13.3	12.7	2.5	—
2675 Die-cut paper and board	1,701	1,940	2,024	2,025	—	14.1	4.3	0.0	—
2678 Stationery products	1,115	1,223	1,283	1,190	—	9.7	4.9	−7.2	—
2679 Paper products nec	3,388	3,766	3,904	3,995	—	11.2	3.7	2.3	—
Value of shipments (1987$)	10,176	10,676	10,621	10,698	10,872	4.9	−0.5	0.7	1.6
2652 Setup paperboard boxes	518	481	486	485	490	−7.1	1.0	−0.2	1.0
2655 Fiber cans, drums, etc	1,495	1,498	1,520	1,520	1,540	0.2	1.5	0.0	1.3
2656 Sanitary food container	1,960	2,118	2,139	2,150	2,182	8.1	1.0	0.5	1.5
2675 Die-cut paper and board	1,701	1,845	1,775	1,784	1,811	8.5	−3.8	0.5	1.5
2678 Stationery products	1,115	1,122	1,119	1,124	1,141	0.6	−0.3	0.4	1.5
2679 Paper products nec	3,388	3,613	3,582	3,635	3,708	6.6	−0.9	1.5	2.0

[1] Advance data from the 1988 Annual Survey of Manufactures.

[2] Estimate.

[3] Forecast.

[4] Value of all products and services sold by establishments in the other paper and board products industry.

[5] Value of products classified in the other paper and board products industry produced by all industries.

SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA). Estimates and forecasts by ITA.

Official Board Markets, Magazines For Industry Inc. 233 N. Michigan Avenue, Chicago, IL 60601. Telephone: (312) 938-2300.

Paper Age, Global Publications Inc. 400 Old Hook Road, Westwood, NJ 07675. Telephone: (201) 666-2262.

Paper, Film and Foil Converter, Maclean Hunter Publishing Company 29 N. Wacker Drive, Chicago, IL 60606. Telephone: (312) 726-2802.

Paper, Benn Publications Ltd. Sovereign Way, Tonbridge, Kent TN9 1RW, England. Telephone: +44 (732) 364422

Pima Magazine, Paper Industry Management Association 2400 E. Oakton St., Arlington Heights, IL 60005. Telephone: (708) 956-0250.

Paperboard Packaging, Edgell Communications Inc. 7500 Old Oak Boulevard, Cleveland, OH 44130. Telephone: 1-800 225-4569.

Pulp and Paper, Miller Freeman Publications, 500 Howard Street, San Francisco, CA 94105. Telephone: (415) 397-1881.

Pulp and Paper International, Miller Freeman Publications, 500 Howard Street, San Francisco, CA 94105. Telephone: (415) 397-1881.

Monthly Statistical Summary, American Paper Institute, 260 Madison Avenue, New York, N.Y. 10016. Telephone: (212) 340-0630.

Walden's Fiber and Board Report, Walden-Mott Corp. 475 Kinderkamack Road, Oradell, NJ 07649. Telephone: (201) 261-2630.

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11

Cans and Containers

The value of product shipments of rigid containers (metal cans, glass containers, and plastic bottles) will rise an estimated 1.2 percent in constant dollars during 1991, following a gain of 2.0 percent in 1990. General economic malaise restricts unit shipment growth to incremental gains for each rigid packaging type.

The rigid container industry includes producers of metal cans (SIC 3411), glass containers (SIC 3221), and plastic bottles (SIC 3085). Because of intense competition among package types, several companies have diversified their packaging operations, and many now produce across the spectrum of rigid containers and/or supply all major end-use markets. Commercial manufacturers produce the bulk of these containers, but the end-user industries also have significant "captive" production.

Before reading this chapter, please see "How to Get the Most Out of This Book" on page 1. It will clarify questions you may have concerning data collection procedures, factors affecting trade data, forecasting methodology, the use of constant dollars, the difference between industry and product data, sources and references, and the Standard Industrial Classification system (SIC). For other topics related to the subject of this chapter, see chapter 14, (Plastics and Rubber); 15, (Metals); and 33, (Foods and Beverages.)

Product shipments of rigid containers rose 2.7 percent to 203.5 billion units in 1990. Market share by package type changed slightly from that of 1989, with cans rising to 62.2 percent, glass falling to 20.2 percent, and plastic remaining at 17.6 percent. Metal cans gained market share, as they have done since 1987, because of economic efficiencies realized from packaging beverages in cans. At the same time, plastic's expansion of market share has been halted because of end-user concerns about the stability of resin prices and the environmental consequences of packaging in plastics.

The end-use markets for rigid containers are consumer food, beverages (soft drinks and other), and general packaging (such as toiletries/cosmetics, medicinal/health, and household chemicals). Market shares in 1990 were 26 percent for food, 62 percent for beverages, and 12 percent for general packaging. Keen interpackage competition and a time frame of only three-to-five years between package introduction and widespread use make container prices and

Trends and Forecasts: Cans and Containers (SIC 3085, 3221, 3411)

(in millions of dollars except as noted)

						Percent Change			
Item	1987	1988[1]	1989[2]	1990[2]	1991[3]	1987-88	1988-89	1989-90	1990-91
Industry Data									
Value of shipments[4]	18,627	19,152	20,649	21,682	22,623	2.8	7.8	5.0	4.3
3085 Plastics bottles	2,835	3,192	3,498	3,561	3,764	12.6	9.6	1.8	5.7
3221 Glass containers	4,778	4,704	4,906	5,117	5,322	−1.5	4.3	4.3	4.0
3411 Metal cans	11,014	11,255	12,245	13,004	13,537	2.2	8.8	6.2	4.1
Value of shipments (1987$)	18,627	18,904	19,669	20,057	20,308	1.5	4.0	2.0	1.3
3085 Plastics bottles	2,835	2,981	2,976	3,062	3,121	5.1	1.8	2.9	1.9
3221 Glass containers	4,778	4,738	4,883	4,878	4,888	−0.8	1.8	−0.1	0.2
3411 Metal cans	11,014	11,184	11,810	12,117	12,299	1.5	5.6	2.6	1.5
Capital expenditures	733	679	—	—	—	−7.4	—	—	—
3085 Plastics bottles	172	142	—	—	—	−17.4	—	—	—
3221 Glass containers	227	240	—	—	—	5.7	—	—	—
3411 Metal cans	334	298	—	—	—	−10.8	—	—	—
Product Data									
Value of shipments[5]	18,223	18,669	20,129	21,128	22,047	2.4	7.8	5.0	4.3
3085 Plastics bottles	2,850	3,240	3,551	3,615	3,821	13.7	9.6	1.8	5.7
3221 Glass containers	4,721	4,637	4,836	5,044	5,246	−1.8	4.3	4.3	4.0
3411 Metal cans	10,653	10,791	11,741	12,469	12,980	1.3	8.8	6.2	4.1
Value of shipments (1987$)	18,223	18,482	19,201	19,579	19,822	1.4	4.0	2.0	1.2
3085 Plastics bottles	2,850	3,026	2,991	3,078	3,136	6.2	1.8	2.9	1.9
3221 Glass containers	4,721	4,675	4,824	4,819	4,829	−1.0	1.8	−0.1	0.2
3411 Metal cans	10,653	10,782	11,386	11,682	11,857	1.2	5.6	2.6	1.5

[1] Advance data from the 1988 Annual Survey of Manufactures.

[2] Estimate.

[3] Forecast.

[4] Value of all products and services sold by establishments in the cans and containers industry.

[5] Value of products classified in the cans and containers industry produced by all industries.

SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA). Estimates and forecasts by ITA.

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Because of intense competition among package types, several companies have diversified their packaging operations, and many now produce across the spectrum of rigid containers.

characteristics important selling points. The selection of a particular type of package is also influenced by population and income/expenditure trends, consumer lifestyles, perceptions of packaging, and waste management/recycling.

Changes in the U.S. population, the workplace, and cooking technology are driving packaging decisions. The baby boom generation is aging, with the 45-54 age category expected to have the largest growth in population share during the next five years. This category is dominated by married people who have relatively high levels of income and spend more money at the supermarket than any other age group. Another important development is the increase in the number of working women and dual income households. Currently, 57.5 percent of all women over the age of 16 are employed, while 63 percent of married couple families with children have both spouses working. In addition, 80 percent of households and a comparable percentage of businesses now own a microwave oven, increasing the availability of high-speed cooking technology. These trends create demand for a "convenient" container that is easy to open, reseal, and store; reasonably priced; durable; light-weight; microwavable; and tamper-evident.

Solid waste management and recycling have taken on increased importance in recent years because of government actions responding to the issue and consumer package preference trending toward recyclable containers. State and local concern about diminishing landfill capacity and rising waste disposal costs has resulted in the enactment of solid waste management legislation that directly or indirectly results in the creation of recycling programs or the implementation of packaging bans. Because of such actions and the rising level of environmental awareness, consumers are attaching expanded importance to recycling of used packaging and increasingly are considering package recyclability when selecting products for purchase. In a recent survey by a packaging trade publication, 65 percent of the consumers polled often or sometimes based their purchasing decisions on the recyclability of the container. Of those surveyed, 63 percent were willing to pay up to 10 cents more for the product in order to obtain an easily recyclable package.

The rigid container industry's concern about the solid waste issue and its affect on business operations is best exemplified by the results of a recent survey of packaging professionals. Of those polled, 85 percent were extremely or moderately concerned about packaging's actual impact on the environment; an even greater number, 88 percent, were concerned about packaging's *perceived* impact on the environment. Over half of the respondents agree that public—and even more important—government perception of the environmental consequences of using packaging will significantly or moderately affect their business operations.

INTERNATIONAL COMPETITIVENESS

International trade in the rigid container industry is limited in quantity and value and is difficult to interpret with available data. As it is generally not cost effective to ship empty containers over long distances, international trade in rigid packaging is most significant with contiguous countries, that is, Canada and Mexico. The industry definitions used for aggregating trade information differ from those used for domestic shipments. The values for plastic bottles and glass containers include items other than those contained in this chapter, while the data on metal cans does not include values for steel cans.

The current-dollar value of can and container exports rose 63 percent to $212 million in 1990. Foreign demand for U.S. rigid packaging grew with the decline in the value of the dollar. Export growth was lead by shipments in aluminum cans, but a strong performance was also contributed by plastic bottles. Canada and Mexico were the leading recipients of U.S. rigid container exports, largely because of their geographic proximity. However, Japan and the 12 nations comprising the European Community (EC)

U.S Exports and Imports
Cans and Containers

(in millions of dollars except as noted)

SIC	Industry	1989	1990[1]	1991[2]	Percent Change 1989-90	Percent Change 1990-91
3085	Plastics bottles					
	Value of exports	50.0	87.5	131	75.0	49.7
	Value of imports	48.2	50.1	52.1	3.9	4.0
3221	Glass containers					
	Value of exports	47.7	59.6	74.5	24.9	25.0
	Value of imports	177	195	209	10.2	7.2
3411	Metal cans					
	Value of exports	32.4	64.8	130	100.0	100.6
	Value of imports	45.7	54.8	65.8	19.9	20.1
	Cans and Containers					
	Value of exports	130	212	335	63.1	58.0
	Value of imports	271	300	327	10.7	9.0

[1] Estimate.

[2] Forecast.

SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA). Estimates and forecasts by ITA.

U.S. Trade Patterns in 1989

Cans and Containers

SIC 3085, 3221, 3411

(in millions of dollars, percent)

Exports			Imports		
	Value	Share		Value	Share
Canada & Mexico	63.2	48.5	Canada & Mexico	121	44.6
South America	1.6	1.2	South America	7.9	2.9
European Community	13.0	10.0	European Community	34.9	12.9
East Asia NICs	6.3	4.9	East Asia NICs	13.1	4.8
Japan	12.6	9.7	Japan	3.9	1.4
Other	33.4	25.7	Other	90.3	33.3
World Total	130	100.0	World Total	271	100.0
Top Five Countries					
	Value	Share		Value	Share
Canada	48.9	37.5	Canada	73.8	27.2
Mexico	14.3	11.0	France	54.9	20.3
Japan	12.6	9.7	Mexico	47.0	17.4
United Kingdom	5.5	4.3	West Germany	20.7	7.6
Bahamas	3.9	3.0	Italy	18.6	6.9

Note: See "How to Get the Most Out of This Book" for definitions of the Country Groupings. Industry definitions for the purpose of trade data are not consistent with industry definitions for chapter 11.

SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA).

also received significant shipments, as glass demand in the EC and aluminum beverage can demand in Japan was sufficient to encourage container exports despite high transportation costs.

A falling dollar limited import growth to 10.7 percent, with current-dollar values rising to $299.9 million. Glass containers, at $195 million, were the predominant imported package, accounting for 65 percent of total value of imports. Canada, Mexico, and France were the leading countries in glass container shipments.

The rigid container industry is projected to have a trade surplus in 1991, as the value of exports is expected to exceed the value of imported cans and containers. The current-dollar value of exports is forecast to rise 58 percent to $335.3 million. Imports are also expected to rise, albeit at a decreasing rate, with current-dollar values at $326.6 million. Metal can and plastic bottle exports will experience significant growth, rising to $129.6 and $131.2 million, respectively. Glass containers will continue to dominate imports—a 64 percent share with shipments valued at $208.7 million.

Metal Cans

The metal can segment of the industry experienced another year of market growth in 1990, with total product shipments rising 3.6 percent to 126.6 billion units. While the bulk of the increase in unit shipments can be attributed once again to growth in aluminum soft drink packaging, there was also a positive contribution by the beer and food can segments for the second year in a row. Although aluminum continued to dominate beer (99 percent) and soft drink (92 percent) markets and steel retained control of the food (91 percent) and general packaging (99 percent) categories, each material managed to make inroads into the other's market share in certain end-use segments. Steel increased its market presence in soft drinks to 8 percent and aluminum gained an additional percentage point in food, to 9 percent.

Table 1: Metal Can Unit Shipments

(in billions of units)

Market	1987	1988	1989	1990[1]	1991[2]
TOTAL	110.4	114.6	122.2	126.6	128.5
Beer	36.5	36.3	37.3	38.3	39.2
Soft Drinks	40.3	44.9	49.5	52.5	54.1
Food	29.5	29.3	31.4	31.8	31.3
General Packaging	4.1	4.1	4.0	4.0	3.9

[1] Estimate

[2] Forecast

SOURCES: U.S. Department of Commerce: Bureau of the Census and International Trade Administration; industry sources.

The current-dollar value of metal can product shipments rose 6.2 percent in 1990 to $12.5 billion, with the producer price index rising an estimated 2.6 percent. The metal can industry was able to raise prices moderately during the year because demand for beverage containers expanded while capacity to produce those containers contracted. The pricing leverage of the can producers was further augmented by industry consolidation that placed control of 50 percent of beverage can capacity in the hands of two companies, Crown Cork & Seal and American National. Industry consolidation among beverage producers, backward integration into ingot and/or can stock, and relative stability in the transaction price for can stock helped can manufacturers to control costs and increase profitability.

The revitalization of steel as a beer and soft drink package continued in 1990, with unit shipments experiencing significant growth. The increase in steel beverage cans has occurred primarily because of steel's raw-material cost advantage over aluminum, $3–4 per thousand. As a consequence, the use of steel gives can manufacturers with production capability in either metal an advantage in negotiating more favorable can stock contracts and provides beverage producers with an alternative, price-competitive package.

Outlook for 1991

Metal can shipments are expected to reach 128.5 billion units in 1991, up 1.5 percent from 1990. The drop off in shipment growth from prior year levels is due predominantly to a poorly performing economy; soft drink consumption usually grows at a slower rate at such times and it is soft drink shipments that have fueled the engine of metal container growth. The weakening of the soft drink category will be somewhat offset by continued growth in the beer segment, as a tight economy tends to shift consumption from premium-priced beers packaged in glass to popular-priced beers packaged in cans. This will occur despite an increase in the excise tax on alcoholic beverages. Shipments of metal food cans will rise slightly as cost-conscious consumers seek to stretch their food dollar. General packaging will fall incrementally as self-maintenance (home and auto) activities continue to decline.

Beverage container pricing and the market share contest between steel and aluminum continue to be significant issues for the metal can industry during 1991. Although the beverage can manufacturers have positioned themselves to implement a significant price increase, prices should only experience modest growth during the year. The industry will fail to achieve more significant price growth because of a resumption of the discounting of soft drink products, weakness in the soft drink segment, stability in the price of can stock, and incremental capacity growth as a consequence of conversions from steel to aluminum. Steel will lose some of the market share that it has recently acquired, as its cost-advantage over aluminum is eroded and its recycling performance fails to meet expectations. Because of this, market share for aluminum will rise in both soft drink and food, with aluminum accounting for 11 percent of the food can market in 1991.

Long-Term Prospects

The metal can industry is expected to grow at an average annual rate of 3 percent, measured in constant dollars, during the 1991–95 period. This moderate growth will be sustained because the metal can is reliable, inherently tamper-evident, cost-efficient, and the most profitable container at the retail level.

Metal cans for food and beverage will continue to enjoy modest demand because of the nature of the products packaged and the characteristics of the container. Aluminum will be the preferred package among brewers, bottlers, and distributors because of the product's compactness, adaptability to high-speed filling lines, light weight, low distribution costs, and high operating profit per packaged ounce. Food staples, excepting juice products, will continue to be packaged primarily in steel, as this is a mature and cost-efficient technology. There is the potential for stronger growth for steel in the food category during this period, as microwavable metal containers challenge plastic, paper, and composite packaging forms.

Glass Containers

In 1990, product shipments of glass containers fell 1 percent to 285.1 million gross (12-dozen) units, or 41.1 billion individual units. Despite the loss in shipment volume, the current-dollar value of product shipments climbed 4.3 percent to $5.0 billion, with a 4.4 percent increase in the producer price index. Food glass continued to dominate shipments with a 33 percent share, while beverages and beer accounted for 22 and 31 percent, respectively. Alcoholic beverage containers represented 9 percent of shipments and general packaging contributed 5 percent.

The slight drop in shipments was due to incremental losses that occurred in virtually every end-use segment. Weakness in soft drink consumption combined with heavy competition from plastic for three-quarters of the year reduced shipments to the soft drink industry, while a greater emphasis on cans in the brewing industry decreased demand for glass containers. Continuation of the trend away from alcohol consumption hurt the liquor and wine markets despite consumer preference for premium distilled spirits (which are typically packaged in glass because of its quality image). The general packaging category (medicinal/health, chemical, and toiletries/cosmetics end-uses) suffered from incremental market declines as old products in glass were eliminated and new products in plastic were introduced. The only bright spot was food glass, which experienced modest growth as a result of new product introductions in dressings, sauces, and condiments.

Table 2: Glass Container Unit Shipments

(in millions of gross units)

Market	1987	1988	1989	1990[1]	1991[2]
TOTAL	281.6	280.4	285.5	285.1	285.8
Food	89.9	89.9	92.0	94.7	97.1
Beverages	62.4	62.4	63.8	63.0	64.2
Beer	85.4	86.3	88.5	87.1	85.4
Liquor	11.8	10.4	11.3	11.1	10.8
Wine	16.5	16.1	14.8	14.4	14.0
Medicinal & health	8.6	9.4	9.6	9.4	9.2
Chemicals	1.4	1.3	1.3	1.3	1.2
Toiletries & cosmetics	5.6	4.6	4.2	4.1	3.9

[1] Estimate.

[2] Forecast.

SOURCES: U.S. Department of Commerce, International Trade Administration; industry sources.

As a result of further industry consolidation and plant capacity rationalization, glass container manufacturers were able to push through a modest price increase during 1990. However, growth in manufacturing and transportation costs continued to restrict profitability at a time when the major producers are laden with debt.

Outlook for 1991

Glass container shipments in 1991 are forecast to rise 0.2 percent to 285.8 million gross units, as a soft economy limits further expansion. The food market will continue to experience growth with new product introductions of ethnic, regional, and gourmet foodstuffs. Despite the weakness in soft drink consumption, shipments to the beverage industry will rise incrementally as the contribution from plastic conversions to glass in soft drink are combined with growth in other beverages (i.e., seltzers, waters, juice-added drinks, etc.). Although beers in long-neck bottles continue to be popular for both the domestic and export market, shipments of beer in glass containers will decline as consumers switch to popularly-priced beer in cans because of the tight economy and the higher price-tag for alcoholic beverages. Lackluster performance in the liquor and wine segments, combined with incremental market losses in the general packaging categories, restrict further expansion.

Glass container manufacturers are expected to realize a price increase in 1991 comparable to that obtained during 1990. More significant gains in pricing cannot be attained despite additional plant closures, as investment in the highly productive press-and-blow machinery tends to add incremental capacity.

Long-Term Prospects

The glass container industry is expected to grow at an average constant-dollar rate of 1 percent annually during the 1991–95 period. The end-use markets for glass will become more concentrated during this period because of declines in the liquor, wine, and general packaging categories. Glass packaging in these market segments will be limited to products that require containers with characteristics inherent in glass (i.e., visibility and inert substance) or a "premium" image. Most glass containers will be used for food and beverages because of their high consumer acceptance, image of purity and prestige, microwavability, barrier properties, and recyclability.

Plastic Bottles

Plastic bottle shipments in 1990 rose 2.9 percent to 35.8 billion units. Despite this modest increase, the current-dollar value of product shipments rose less than 2 percent to $3.6 billion as declines in resin and thus in bottle prices caused the producer price index to fall 1.1 percent (see Table 3).

Table 3: Plastic Bottle Shipments

(in millions of units)

Market	1987	1988	1989	1990[1]	1991[2]
TOTAL	33,134	34,179	34,799	35,798	36,480
Household chemicals	4,136	4,501	4,354	4,484	4,618
Industrial chemicals	400	428	478	501	521
Automotive & marine	2,700	2,903	3,047	3,138	3,216
Toiletries/cosmetics	2,889	2,975	3,210	3,467	3,709
Medicinal & health	4,113	4,154	4,379	4,597	4,781
Food:					
Milk	5,291	5,317	5,352	5,382	5,413
Other food	2,540	2,514	2,587	2,624	2,662
Beverages:					
Soft drinks	7,000	7,150	7,000	7,105	6,963
Other beverage	2,640	2,798	2,937	3,039	3,130
Other	1,425	1,439	1,455	1,461	1,467

[1] Estimate.

[2] Forecast.

SOURCES: U.S. Department of Commerce: Bureau of the Census and International Trade Administration; industry sources.

Although resin and bottle prices were decreasing for the greater part of the year, plastic bottle shipment growth was modest because of continuing end-user concern about resin availability, price stability, and environmental accountability. The crisis in the Middle East prompted an increase in resin prices and raised questions about future ability to obtain material. End-user and consumer interest in environmental responsibility saw plastic facing increased competition from traditional container materials (e.g., paper, glass, and aluminum) or flexible packaging forms that have higher recycling rates or offer greater source reduction benefits. At the same time, the dampening effect of end-user uneasiness was largely offset by shipment growth that occurred as a consequence of market expansion, package material substitution, and new product introductions that capitalized on plastic's moldability, light weight, durability, and low distribution costs.

General packaging remained the largest single end-use for plastic bottles, stabilizing at 45 percent of shipments. Plastic's share of beverage packaging (28 percent) was also static as weakness in soft drink consumption offset gains from declining resin prices. Food and "other" packaging accounted for 22 and 4 percent, respectively, of plastic bottle shipments. High density polyethylene (HDPE) and polyethylene terephthalate (PET) continued to comprise the majority of resin used to produce plastic bottles.

Plastic bottle shipments in 1990 followed the pattern of modest growth that has been demonstrated by the industry since 1987. Shipments grew 1.8 percent from 1988 to 1989 and 2.9 percent from 1989 to 1990. Three primary factors have contributed to the slowdown: (1) the easy, large-volume conversions have already occurred; (2) requirements relating to heat or permeability in the food and "other" beverage categories are not met by existing resins; and (3) end-users' concern about the stability of resin prices and the impact of the environmental consequences of packaging in plastic.

The plastic bottle industry continued to make progress on the environmental front during 1990. The use of reprocessed, postconsumer resin increased in a number of bottle constructions and applications and the availabilty of containers manufactured with the material expanded. The industry has committed itself to increasing reprocessed material content in its containers and to expanding the market presence of such packages as more postconsumer plastic is accumulated and processed.

Outlook for 1991

Plastic bottle shipments in 1991 are expected to rise 1.9 percent to 36.5 billion containers. Incremental growth will be a consequence of poor economic performance, high resin and bottle prices, a weak soft drink market, environmental concerns, and technological constraints on package performance.

Long-Term Prospects

The factors that currently hamper growth in plastic bottle shipments will continue to trouble the industry during the initial years of the 1991-95 period. Such circumstances could result in flat or incremental shipment growth for plastic bottles, with plastic usage conceivably narrowing to materials and bottle constructions that are most readily recyclable and safely burnable. Massive packaging conversions away from plastic will not occur, however, because plastic's durability is extremely desirable from a consumer standpoint in many end-use markets.

By the end of the five-year period, plastic bottle manufacturers will have begun to overcome many of the problems that have been limiting shipments. The advent of resins that can withstand high temperature processing and provide greater resistance to permeation will fuel movement into the food and "other" beverage category.—*Kimberly G. Copperthite, Office of Basic Industries, (202) 377-5159, September 1990.*

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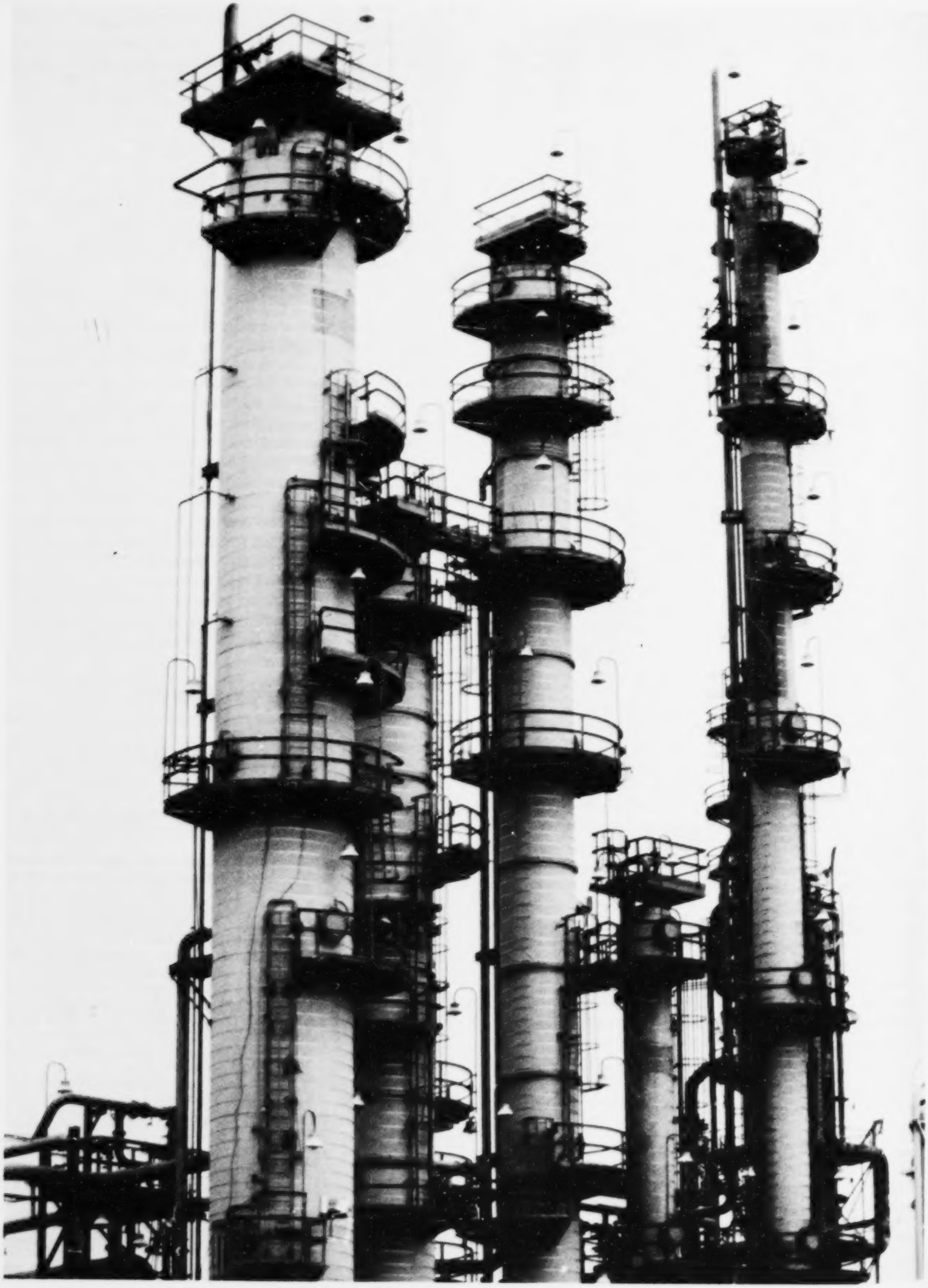

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Chemicals and Allied Products

The value of chemicals and allied products industry shipments is expected to increase by 1.1 percent in 1991. The largest increase will occur for surface active agents, adhesives and sealants, pharmaceutical preparations, and phosphatic fertilizers. Exports as well as imports will increase, but at rates significantly lower than in previous years.

Chemical and allied products is one of the largest U.S. industries, producing more than 50,000 different chemicals and formulations in more than 12,000 U.S. chemical plants. There are about 1.1 million people directly employed in U.S. chemical production, and chemicals from the United States are sold in more than 180 countries. The industry has consistently had a positive trade balance and currently there are at least 20,000 different chemicals involved in two-way trade.

Before reading this chapter, please see "How to Get the Most Out of This Book" on page 1. It will clarify questions you may have concerning data collection procedures, factors affecting trade data, forecasting methodology, the use of constant dollars, the difference between industry and product data, sources and references, and the Standard Industrial Classification system (SIC). For other topics related to the subject of this chapter, see chapters 9 (Textile Mill Products), 10 (Paper and Allied Products), 11 (Cans and Containers), 13 (Industrial and Agricultural Chemicals), 14 (Plastics and Rubber), 18 (Advanced Materials) 36 (Cleaning Preparations and Cosmetics), and 45 (Drugs).

The chemical industries (SIC 28) sector covers inorganic and organic chemicals (including industrial gases and pigments), plastic resins and synthetic rubber, drugs and pharmaceuticals, soaps and other detergents, cosmetics, paints and coatings, agricultural chemicals (including fertilizers and pesticides), adhesives and sealants, explosives, printing inks, and a variety of miscellaneous chemicals (including essential oils, salt, distilled water, etc). This chapter covers overall developments in the chemical industry. Special attention is given to petrochemicals, which comprise nearly half of all chemical industries shipments and is the bulk of chemicals used in value-added products. The chapter also reviews government regulations affecting the chemical industry.

The constant-dollar value of shipments by the chemicals and allied products industry (SIC 28) increased 2.8 percent in 1989 over 1988 shipments. Total constant dollar shipments in 1990 increased 1.6 percent over 1989, because of the strong market for chemical products and technology plus the increased export demand. The aggregate current-dollar value of shipments by these industries increased 7.8 percent from 1988 to 1989, and 5.2 percent from 1989 to 1990 to a level of $297.1 billion. Largely because of chemical processing worldwide, exports by the chemicals industries climbed 17 percent from 1988 to 1989, and 3.7 percent in 1990. Imports over the like period increased 12.9 percent between 1988 and 1989, and 2.53 percent during 1990.

Throughout 1990 it was evident that the U.S. chemicals industry was still emerging from a massive restructuring that began in 1985, including major acquisitions, spin-offs, plant closings, and extensive early retirement and lay-off programs. In 1990, research and development expenditures increased nearly 5 percent over 1989. Capacity utilization of the chemical industry went from 89 percent in 1989 to 78 percent in 1990. The drop was due to diminished requirements in the chemical processing industries, i.e., automotive products, construction materials, electronic and other durable goods.

INTERNATIONAL COMPETITIVENESS

International trade is expected to play a greater role in the future of the chemical industry as developing countries

Exxon Chemical Company

Chemical and allied products is one of the largest U.S. industries, producing more than 50,000 different chemicals and employing 1.1 million people. The value of industry shipments is expected to increase by 1.1 percent in 1991.

increase their production of chemicals. Most countries possess or manufacture some type of chemical. As countries progress up the economic ladder, the raw chemicals are usually converted to value-added products and the chemical processing industry becomes involved.

U.S. Exports and Imports
Chemicals and Allied Products
(in millions of dollars except as noted)

SIC	Industry	1989	1990[1]	1991[2]	Percent Change 1989-90	Percent Change 1990-91
28	CHEMICALS AND ALLIED PRODUCTS					
	Value of exports	35,895	36,541	36,906	–	–
	Value of imports	20,122	20,726	21,244	–	–

[1] Estimate.

[2] Forecast.

SOURCE: U.S. Department of Commerce: Bureau of the Census, International Trade Administration (ITA). Estimates and forecasts by ITA.

With increasing numbers of international players, competition will intensify, placing more pressure on the United States to maintain its positive trade balance record. International competitiveness will also be affected by the increasing role played by environmental regulation of the U.S. chemicals industry. Most other countries count environmental issues as social costs and do not reflect this added expense in the production of many conventional chemicals and petrochemicals. This is not the situation in the United States. A detailed discussion of regulations applicable to the chemical industry is included later in this chapter.

International legal issues such as intellectual property rights, as well as product liability/tort reform, will also continue to require attention in the 1990s. Infringement of intellectual copyright law in other countries has a deleterious effect on U.S. industry; this issue is being addressed in the Uruguay Round of the General Agreement on Tariffs and Trade (GATT). The possibility of litigation resulting from unforeseen effects of new products is also impeding development of advanced products—for example, automobile tires and asbestos substitutes.

In 1991 it is expected that several East-West joint ventures in the chemical area will materialize. As the global nature of the chemical and chemical-processing industries increases, the industry is expected to play and even greater role in international trade during 1991.

U.S. Trade Patterns in 1989
Chemicals and Allied Products
SIC 28
(in millions of dollars, percent)

Exports	Value	Share	Imports	Value	Share
Canada & Mexico	6,309	17.6	Canada & Mexico	4,486	22.3
South America	2,797	7.8	South America	588	2.9
European Community	7,973	22.2	European Community	6,411	31.9
East Asia NICs	6,460	18.0	East Asia NICs	840	4.2
Japan	4,474	12.5	Japan	2,073	10.3
Other	7,882	22.0	Other	5,724	28.4
World Total	35,895	100.0	World Total	20,122	100.0
Top Five Countries					
	Value	Share		Value	Share
Japan	4,474	12.5	Canada	3,910	19.4
Canada	4,304	12.0	West Germany	2,602	12.9
Belgium	2,204	6.1	Japan	2,073	10.3
Mexico	2,006	5.6	United Kingdom	1,954	9.7
Netherlands	1,980	5.5	France	1,354	6.7

See "How to Get the Most Out of This Book" for definitions of the Country Groupings.
SOURCE: U.S. Department of Commerce: Bureau of the Census, International Trade Administration.

Outlook for 1991

The constant-dollar value of chemical industry shipments is forecast to increase 1.1 percent in 1991 over 1990 shipments. Exports in 1991 are likely to increase by 1 percent with imports increasing 2.5 percent. This would result in a net positive trade balance in 1991 of $15.8 billion. During 1991 restructuring is expected to continue with acquisitions of U.S. companies by both domestic and foreign companies. Great Britain, Germany, France, and Japan are the major purchasers of U.S. chemical firms. It is expected that during 1991 the industry will continue to move away from the sales of low unit price high-volume commodity chemicals to high-unit price specialty chemicals. An increase in research and development expenditures is expected in 1991, but at a slower rate than in 1990. Also, the industry in 1991 will continue to deal with the problem of finding employees with adequate technical expertise.

Long-Term Prospects

The chemical industry will be central to technological developments of the future, including those in the aero-

Trends and Forecasts: Chemicals and Allied Products (SIC 28)
(in millions of dollars except as noted)

Item	1987	1988[1]	1989[2]	1990[2]	1991[3]	Percent Change 1987-88	Percent Change 1988-89	Percent Change 1989-90	Percent Change 1990-91
Industry Data									
Value of shipments[4]	230,022	260,839	277,727	292,432	–	13.4	6.5	4.0	–
Value of shipments (1987$)	230,022	240,534	245,402	249,397	252,011	4.6	2.0	1.6	1.1
Total employment (000)	815	832	–	–	–	2.1	–	–	–
Production workers (000)	463	477	484	488	–	3.0	1.5	0.8	–
Average hourly earnings ($)	13.04	13.20	–	–	–	1.2	–	–	–
Capital expenditures	8,712	10,761	–	–	–	23.5	–	–	–
Product Data									
Value of shipments[5]	214,621	243,242	262,813	–	–	13.3	8.0	–	–
Value of shipments (1987$)	214,621	224,256	231,547	238,197	–	4.5	3.3	2.9	–

[1] Advance data from the 1988 Annual Survey of Manufactures.

[2] Estimate.

[3] Forecast.

[4] Value of all products and services sold by establishments in the chemicals and allied products industry.

[5] Value of products classified in the chemicals and allied products industry produced by all industries.

SOURCE: U.S. Department of Commerce: Bureau of the Census, International Trade Administration (ITA). Estimates and forecasts by ITA.

space, electronic, auto, and construction materials industries. As a major player in technological progress, the industry is expected to become one of the main indicators of the overall U.S. economy. New materials such as engineering polymers, composites, advanced ceramics, and adhesive and sealants, are changing not only the way materials are produced, but also the finished products. Thus, like the general economy, the industry expects growth, but at a slower rate.

Long-term performance of the chemicals industry depends on public perception of the social and environmental impact of chemical products. This perception is important in a broad range of issues, from locations of future plants to recruitment of the best and brightest young people to the field.

PETROCHEMICALS

The value of petrochemical industry shipments, in constant dollars, is expected to increase 1.0 percent in 1991. The petrochemical industry consists of plastic materials, synthetic resins, and nonvulcanizable elastomers (SIC 2821); plastic materials and synthetic resins, synthetic rubber, cellulosic and other manmade fibers (SIC 2822); manmade organic fibers (SIC 2824); surface active agents, finishing agents, sulfonated oils (SIC 2843); cyclic organic crudes and intermediates, and organic dyes and pigments (SIC 2865); industrial organic chemicals, nec (SIC 2869); nitrogenous fertilizers (SIC 2873); and carbon black (SIC 2895).

U.S. exports of petrochemicals increased 3 percent over the $20.8 billion shipped in 1989, to reach $21.4 billion in 1990. This represents a significant slowing in the rate of growth in the industry; exports had increased nearly 22 percent from 1987-88, and 17 percent from 1988-89. A weakening of world-wide chemical processing industries throughout the world, price decreases, and market saturation for many products from other countries after several years of rapid export growth combined to produce the slowdown.

Imports for 1990 totaled $9.6 billion, an 8 percent increase over the previous year. Despite the greater increase in imports than in exports, net trade remained at $11.8 billion. The increased import activity reflects a tendency of the restructured U.S. industry to obtain primary and intermediate materials from energy-rich countries when domestic production costs exceed foreign prices for commodity chemicals. This situation, where import prices were close to production costs, existed throughout 1990, but became most evident in the second half of the year.

INTERNATIONAL COMPETITIVENESS

Petrochemicals account for over 20 percent of all the chemicals in world trade. New production facilities are scheduled to begin operations in East Asia between 1992 and 1995, with Korea, China, Malaysia, Indonesia, the Philippines, and Taiwan each planning to build world-scale facilities. This new capacity will further depress the U.S. export market share in East Asia.

Existing petrochemical producers around the world are considering the advantages of shifting production to energy-rich countries possessing investment opportunities, so that they can take advantage of lower cost fuel and feedstocks. Japan has been investing in Korea and Indonesia. U.S. industry is investigating opportunities in Mexico and Eastern Europe. Conclusion of a U.S.-Mexico Free Trade Agreement may induce corporate interests to finance new petrochemical facilities in that country. Mexico has indicated need for a $5-7 billion infusion in its petrochemical and chemical processing industries. East European petrochemical organizations—in Poland, Hungary, Czecholovakia, and the USSR, for example—would require multiples of that amount to achieve state-of-the-art technology.

Outlook for 1991

The slackening demands of the chemical processing industries throughout the world because of the economic downturn will have a negative effect on the petrochemical industry during 1991, especially in Japan and Western Europe. At the same time, in part due to volatility in the Middle East, prices for fuel and feedstock have been increasing. At the end of 1990, the petrochemical market is one of ample supply and weakening prices, and it appears unlikely that increased fuel and feedstock costs will be "passed through" to petrochemical products in 1991. This scenario is further complicated by additional capacity becoming available in South Korea and Taiwan.

Internationally, petrochemical prices are expected to soften gradually throughout 1991. This will affect profits for all petrochemical producers, so capital expenditures are expected to decrease, as will research and development monies. At some unpredictable point, it seems likely that operating capacity, especially among Japanese and West

Trends and Forecasts: Petrochemicals (SIC 2821, 2822, 2824, 2843, 2865, 2869, 2873, 2895)

(in millions of dollars except as noted)

Item	1987	1988[1]	1989[2]	1990[2]	1991[3]	Percent Change 1987-88	1988-89	1989-90	1990-91
Industry Data									
Value of shipments[4]	96,708	113,913	122,437	126,401	—	17.8	7.5	3.2	—
Value of shipments (1987$)	96,708	101,240	104,138	107,928	107,985	4.7	2.9	2.7	1.0
Total employment (000)	254	253	—	—	—	−0.4	—	—	—
Production workers (000)	158	159	164	164	—	0.6	3.1	0.0	—
Average hourly earnings ($)	14.94	15.38	—	—	—	2.9	—	—	—
Capital expenditures	4,423	5,918	—	—	—	33.8	—	—	—
Product Data									
Value of shipments[5]	92,971	109,334	—	—	—	17.6	-	—	—
Value of shipments (1987$)	92,971	97,319	—	—	—	4.7	—	—	—

[1] Advance data from the 1988 Annual Survey of Manufactures.

[2] Estimate.

[3] Forecast.

[4] Value of all products and services sold by establishments in the petrochemicals industry.

[5] Value of products classified in the petrochemicals industry produced by all industries.

SOURCE: U.S. Department of Commerce: Bureau of the Census, International Trade Administration (ITA). Estimates and forecasts by ITA.

European producers, will be cut back to achieve a better supply-demand ratio in the marketplace.

Long-Term Prospects

A projected weakening global economy may eventually cause production cut-backs in the petrochemical industry. Reduced production would occur first with privately held petrochemical companies in free-market countries; producers in managed economy countries would soon follow. The depth and breadth of any slowdown in petrochemical production and trade cannot be predicted.

Worldwide concern about global warming and the need to reduce hydrocarbon emissions cast uncertainity over future fuel and feedstock prices. Should international agreement call for reduced coal usage due to environmental risks, shifts to petroleum and natural gas as alternative energy sources will drive petrochemical raw material and production costs to all-time highs. On an international basis, such an energy sourcing switch would impact U.S. industry more than others, because the U.S. is more dependent upon coal as an energy source than all our trading partners except England, West Germany, and East European countries.

REGULATIONS IN THE CHEMICAL INDUSTRY

The U.S. chemical industry is regulated under such laws as the Emergency Planning and Community Right-to-Know Act; the Clean Air Act; the Toxic Substances Control Act; the Resource Conservation and Recovery Act; Superfund; the Clean Water Act; the Safe Drinking Water Act; and the new Chemical Diversion and Trafficking Act. In addition, the industry meets standards set by the Occupational Safety and Health Administration.

These and many other regulatory obligations increase the industry's capital expenditures and operating costs. In 1989 it is estimated that the chemical industry spent $1.45 billion on capital expenditures for pollution abatement; annualized operating expenditures for pollution abatement accounted for another $3.35 billion.

For additional background about regulations affecting the chemical industry, see the 1990 U.S. INDUSTRIAL OUTLOOK, Chapter 12, (Chemicals and Allied Products), as cited in Additional References at the end of this chapter.

Emergency Planning and Community-Right-to-Know Act

The Emergency Planning and Community-Right-to-Know Act is the third title of the Superfund Amendments and Reauthorization Act, signed into law in 1986. Known as Title III, the Emergency Planning and Community-Right-to-Know Act is a free-standing law that mandates emergency planning and gives communities the right to know more about hazardous materials used by certain industries.

Nearly every industry or business that produces, stores, buys, or ships hazardous materials is covered under the law. For these industries, Title III sets specific reporting requirements and deadlines. Since October 1987, companies involved in the production or handling of certain hazardous materials have had to submit material safety data sheets or lists of chemicals kept on site. On July 1 of each year, covered companies also must report inventories of specific chemicals kept in the workplace and annual releases of hazardous materials into the environment. This Toxic Release Inventory information is available to the public. In addition to their reporting responsibilities under Title III, covered facilities are required to participate in the local emergency-planning efforts mandated by the law.

Covered industries so far have reported environmental releases made from 1987 through 1989. The 1987 and 1988 data are already in an Environmental Protection Agency (EPA) computerized data base that can be accessed by the public. The 1989 data will also be entered into the data base.

Clean Air Act

The Clean Air Act Amendments of 1990 that were signed into law in November impose new standards on industry. Under the guidelines, controls for industrial sources of 41 pollutants must be in place by 1995; for 148 other pollutants, the deadline is 2003. Compliance will cost industry an estimated $25 billion a year.

Toxic Substances Control Act

The Toxic Substance Control Act (TSCA) of 1976 remains in force through a continuing resolution, although it was due for reauthorization in 1984. Reauthorization bills died in both houses of Congress. TSCA affects the chemical industry mainly through its Section 5 program requiring companies to submit a premanufacture notification for each new chemical. This requirement calls for review and testing by manufacturers, and costs millions of dollars each year. EPA has focused enforcement efforts on Section 5 violations, resulting in the assessment of several million dollars in civil penalties. EPA collects information on particular substances under Section 8 of TSCA through the Comprehensive Assessment Information Rule (CAIR). Cost estimates for reporting on the initial list of CAIR chemicals have run as high as $2.9 million. Another area of increased investigative activity by EPA has been under Section 8(e), which requires reporting of substantial risk information. EPA has the authority to assess civil penalties of up to $25,000 per day per violation.

Under TSCA Section 6, EPA can prohibit, limit, or ban the manufacture process, and use of chemicals. Recent activities under Section 6 have involved a new risk management process that highlights nonregulatory and voluntary actions to control individual chemicals.

Resource Conservation and Recovery Act

In 1984, amendments to the Resource Conservation and Recovery Act (RCRA) made major changes in the law, including:

- a complete ban on land disposal of hazardous waste unless no migration from the waste facility will occur for as long as the waste remains hazardous or the waste is treated to EPA-established levels;
- legally mandated deadlines under which congressional decisions become effective, even in the absence of EPA action;
- more stringent standards for the handling and disposing of hazardous waste;

- a schedule for EPA listing of additional categories of chemicals, plus criteria to make delisting more difficult; and
- regulatory control of, and standards for, underground storage tanks.

In 1990, EPA implemented the land-disposal prohibitions required under the 1984 amendments; regulations governing corrective action were also promulgated and will be implemented during the next few years. According to a study conducted for the Chemical Manufacturers Association, the industry could pay $9 billion to $60 billion to clean up hazardous and nonhazardous waste sites during the next decade, depending on the program requirements. Congress began RCRA reauthorization in 1990 and may enact new legislation in 1991.

Superfund

The Superfund Amendments and Reauthorization Act of 1986 that established an $9 billion, five-year fund to pay for the continued cleanup of hazardous waste sites, is scheduled for reauthorization in 1991. Most of the revenues for the fund are generated by $4.15 billion in taxes on industry sectors and a broad-based $2.5 billion corporate tax. General federal revenue appropriations provide $1.25 billion during the five-year period. Interest payments and cost recoveries from responsible parties at waste sites make up the balance of revenues.

Clean Water Act

The Clean Water Act of 1987 guarantees continued progress in ensuring high-quality water. It also increases the severity of civil and criminal penalties for violations of the act.

Five regulations that have been promulgated will have a substantial impact on the chemical industry, if approved. Guidelines limitating effluents were put forward in 1987 setting standards for discharging wastewater from chemicals plants processing into U.S. waters or into sewer systems that lead to municipal treatment plants. Original costs of compliance, as estimated by EPA, were $841 million in initial capital costs and $504 million annually thereafter. A 1989 Appeals Court decision resulted in a remand of major portions of the legislation, saving or deferring millions of dollars in capital and operating costs.

Another rule, introduced in December 1988 to establish permits for stormwater discharges from industrial facilities, is also significant for the industry. Chemical industry facilities would be required to sample and monitor stormwater runoff in compliance with EPA or state standards, resulting in significant compliance costs. A final rulemaking was expected in October 1990. The domestic sewage study regulations finalized in July 1990 would also add costs to the chemical industry. They establish new requirements for wastewater pretreaters that discharge into sewer systems, including a large number of chemical plants.

Yet another significant proposal, from February 1989, would set pollutant standards for sewage sludge. Indirectly, this would affect pretreaters discharging into sewage systems, because it would regulate the amounts of various pollutants that are permitted in the sludge produced by municipal wastewater treatment. The municipal treatment plants, in turn, would be expected to impose more stringent limits on the industrial pretreaters.

Section 3041 of the Clean Water Act directs states to identify toxic "hot spots" in their waters and develop plans to alleviate the problems. Finally, in addition to the proposals or finalized rules discussed above, states are establishing water-quality standards for 126 priority toxic pollutants under the Clean Water Act. In April 1990, EPA announced it would establish such standards for states judged to be in noncompliance.

Safe Drinking Water Act

The 1986 Safe Drinking Water Act Amendments require EPA to set standards for 83 chemicals on a phased, three-year schedule. EPA has set National Primary Drinking Water Requirements (NPDWRs) for 9 of the contaminants, and has proposed NPDWRs for 62 chemicals. Based on the amended definition of "non-transient non-community water system," facilities supplying drinking water to workers must comply with the NPDWRs. Of more significance, NPDWRs are also used in Superfund cleanups and Resource Conservation and Recovery Act corrective actions.

The amendments also provide for protecting groundwater quality around a public well. Although authorized, EPA has not requested funding for the Wellhead Protection Plan, citing budgetary constraints. In spite of this lack of funding, about 20 states have submitted wellhead protection programs to EPA for approval.

Chemical Diversion and Trafficking Act

Chemical companies are subject to the Chemical Diversion and Trafficking Act passed in 1988 to address the problem of diverting chemicals to make illegal drugs. The law contains three key provisions: (l) the seller of chemicals must keep detailed records; (2) sellers must report suspicious purchases and unusual or excessive losses; and (3) the Drug Enforcement Administration is authorized to control export and import transactions.

Occupational Safety and Health

The chemical industry meets hazard identification standards established by the Occupational Safety and Health Administration (OSHA). The standards require extensive documentation of chemicals in trade and in the workplace and mandate warning labels on containers. In 1980, OSHA estimated the chemical industry's compliance costs at $719.8 million initially, plus about $400 million annually. In July 1990, OSHA released its proposed rule on process safety management intended to prevent major industrial accidents while minimizing the consequences of accidents involving high-risk chemicals.

Other standards met by the chemical industry include OSHA's Hazard Communication Standard and state and local laws, which give workers the right to know about hazardous chemicals in the workplace. In addition to implementing the standards, the Chemical Manufacturers Association is improving its methods for communicating product information through a uniform material safety data sheet that is receiving global acceptance and could become an international standard.

The chemical industry also complies with OSHA's updated permissible exposure limits for some 6OO hazardous substances. OSHA updated the limits, based on current health effects data, in January 1989.—*Vincent Kamenicky,* *Office of Chemicals and Allied Products, (202) 377-0128, November 1990.*

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Industrial and Agricultural Chemicals

Constant-dollar shipments of industrial chemicals are expected to increase about 1.6 percent in 1991. Shipments of organics will rise 0.9 percent, inorganics will increase 2.9 percent, coatings and adhesives will rise 1.4 percent, and shipments of agricultural chemicals should grow about 5.9 percent. As with other sectors of the chemical industry, regulatory and environmental issues will continue to be a challenge for producers of industrial chemicals.

Before reading this chapter, please see "How to Get the Most Out of This Book" on page 1. It will clarify questions you may have concerning data collection procedures, factors affecting trade data, forecasting methodology, the use of constant dollars, the difference between industry and product data, sources and references, and the Standard Industrial Classification system (SIC). For other topics related to this chapter, see chapter 12 (Chemicals and Allied Products).

ORGANIC CHEMICALS

Measured in constant dollars, shipments of cyclic crudes and intermediates (SIC 2865), and industrial organic chemicals, n.e.c. (SIC 2869) are expected to increase 0.9 percent in 1990.

In 1990, shipments of organic chemicals reached $69.3 billion, a 4.3 percent gain over 1989 in constant dollars. Organic chemicals are defined as compounds of carbon. Industrial organic chemicals (SIC 286) are classified as gum and wood chemicals (SIC 2861), cyclic crudes and intermediates (SIC 2865), and industrial organic chemicals, n.e.c. (SIC 2869). This section deals only with SIC 2865 and SIC 2869, which are combined for economic review.

Exports of organic chemicals decreased 10 percent in 1990, and operating capacity seldom exceeded 80 percent. Changes in the value of the dollar affected sales both in domestic and foreign markets. Imports for 1990 remained in the $10 million range. However, in terms of quantity, imports increased, the result of currency variations that lowered unit price. The export and import trends of 1990 are expected to become more pronounced, and imports are expected to serve an increasing share of domestic demand.

Organic chemicals in general are subject to stringent Federal, state, and local regulations. Most regulations tend to raise production costs and, depending upon economic conditions, the higher costs cannot always be recouped dollar for dollar. When that happens, U.S. chemicals can become less competitive in international markets. Domestic concerns about the environment should increase demand for certain organic flocculants and coagulants which are used in water treatment.

INTERNATIONAL COMPETITIVENESS

Exports of organic chemical represent 15 percent of total U.S. chemicals sold abroad. Imports account for 16 percent of U.S. chemical trade. Because of its high dependence on purchases by foreign chemical processing industries, the industry is particularly sensitive to worldwide economic conditions.

Exports of organic chemicals increased 1.8 percent in 1990, while imports increased 3 percent. These results reflect structural adjustments to the U.S. chemical industry. Over the past eight years, the chemical industry has shifted

Trends and Forecasts: Organic Chemicals, Except Gum and Wood (SIC 2865, 2869)

(in millions of dollars except as noted)

Item	1987	1988[1]	1989[2]	1990[2]	1991[3]	Percent Change 1987-88	1988-89	1989-90	1990-91
Industry Data									
Value of shipments[4]	51,048	60,157	66,233	69,312	70,354	17.8	10.1	4.6	1.5
Value of shipments (1987$)	51,049	54,804	56,374	58,807	59,331	7.4	2.9	4.3	0.9
Total employment (000)	123	119	120	119	119	−3.3	0.8	−0.8	0.0
Production workers (000)	71.3	70.4	71.1	70.8	70.3	−1.3	1.0	−0.4	−0.7
Average hourly earnings ($)	15.98	16.47	—	—	—	3.1	—	—	—
Capital expenditures	2,366	3,147	—	—	—	33.0	—	—	—
Product Data									
Value of shipments[5]	46,576	55,004	60,773	61,572	63,022	18.1	10.5	1.3	2.4
Value of shipments (1987$)	46,576	50,022	51,573	52,207	52,898	7.4	3.1	1.2	1.3

[1] Advance data from the 1988 Annual Survey of Manufactures.

[2] Estimate.

[3] Forecast.

[4] Value of all products and services sold by establishments in the organic chemicals, except gum & wood industry.

[5] Value of products classified in the organic chemicals, except gum & wood industry produced by all industries.

SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA). Estimates and forecasts by ITA.

U.S. Exports and Imports
Industrial and Agricultural Chemicals
(in millions of dollars except as noted)

SIC	Industry	1989	1990[1]	1991[2]	Percent Change 1989-90	Percent Change 1990-91
281A	Industrial Inorg. Chem., Except Pigments					
	Value of exports	4,782	4,880	4,982	2.0	2.1
	Value of imports	4,177	4,071	3,970	−2.5	−2.5
2851	Paints and allied products					
	Value of exports	431	647	695	50.1	7.4
	Value of imports	115	128	140	11.3	9.4
286A	Organic Chemicals, Except Gum & Wood					
	Value of exports	10,171	10,356	10,464	1.8	1.0
	Value of imports	5,786	5,961	6,112	3.0	2.5
287A	Agr. Chemicals, Except Fertilizer Mixing					
	Value of exports	4,445	3,830	4,161	−13.8	8.6
	Value of imports	1,715	1,720	1,819	0.3	5.8
2891	Adhesives and sealants					
	Value of exports	123	148	175	20.3	18.2
	Value of imports	70.0	84.0	97.0	20.0	15.5
	Industrial & Agr. Chemicals					
	Value of exports	19,953	19,861	20,477	−0.5	3.1
	Value of imports	11,864	11,964	12,138	0.8	1.5

[1] Estimate.

[2] Forecast.

SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA). Estimates and forecasts by ITA.

more toward producing higher-value products. The organic chemical industry, basically the commodity product segment, has become more dependent upon imports for its basic chemical products.

Overall weakening of the world economy during 1990 also contributed to increased U.S. imports. On a relative basis, other organic chemical markets weakened more than the U.S. market, and foreign producers redirected their exports to the United States.

Organic chemical production will shift gradually to countries where the availability and cost of petroleum and natural gas, the principal fuel and feedstock, makes this advantageous. Some of these new supply sources will be developed by moving production to lower-cost producing sites, such as Japanese facilities in Indonesia. Other supply sources will be new facilities in developing countries built with assistance from international funding organizations, which defrays capital investment costs.

Outlook for 1991

Softening of the global economy will restrain worldwide growth in the organic chemical industry. The U.S. industry should experience growth of 0.9 percent. If domestic chemical processing industries rebound, there will be a quick upsurge in organic chemicals, which are not inventoried to any extent. Purchase orders would be filled in 30 to 60 days by increasing production schedules. If the trend of exports and imports in 1990 is maintained, it could result in a negative trade balance for the organic chemical industry in 1991.

Long-Term Prospects

Shipments of organic chemicals are expected to grow at the same rate as the gross national product through 1995. The strength of the U.S. economy, the value of the dollar, and the willingness of overseas producers to export to the United States and accept lower returns than in previous years will largely determine the level of domestic production.

U.S. Trade Patterns in 1989
Industrial and Agricultural Chemicals
SIC 2812, 2813, 2819, 285, 2865, 2869, 2873, 2874, 2879, 2891
(in millions of dollars, percent)

Exports	Value	Share	Imports	Value	Share
Canada & Mexico	3,429	17.2	Canada & Mexico	3,013	25.4
South America	1,782	8.9	South America	401	3.4
European Community	3,991	20.0	European Community	3,452	29.1
East Asia NICs	3,984	20.0	East Asia NICs	403	3.4
Japan	2,638	13.2	Japan	1,062	8.9
Other	4,131	20.7	Other	3,543	29.9
World Total	19,953	100.0	World Total	11,864	100.0

Top Five Countries

Exports	Value	Share	Imports	Value	Share
Japan	2,638	13.2	Canada	2,671	22.5
Canada	2,357	11.8	West Germany	1,500	12.6
Netherlands	1,261	6.3	Japan	1,062	8.9
Taiwan	1,167	5.8	Australia	1,012	8.5
Belgium	1,132	5.7	United Kingdom	924	7.8

See "How to Get the Most Out of This Book" for definitions of the Country Groupings.

SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA).

Longer term, the United States will become more dependent on imports. New export-oriented chemical plants constructed in energy-rich developing countries in the Middle East and the Pacific Rim will bring their products into the international marketplace. Competition will become increasingly fierce, and prices of U.S. organic chemicals will come under severe pressure. This could lead to a decline in the industry's profitability.—*Michael Kelly, Office of Chemicals and Allied Products, (202) 377-0128, August 1990.*

Additional References

(Call the Bureau of the Census at (301) 763-4100 for information about how to order Census documents.)

Industrial Organic Chemicals, Census of Manufactures 1987. Bureau of the Census, U.S. Department of Commerce, Washington, D.C. 20230.

INORGANIC CHEMICALS

Inorganic chemicals (SICs 2812, 2813, 2819) constitute almost 25 percent of U.S. shipments of industrial organic and inorganic chemicals. They are predominantly basic chemicals (also called heavy, bulk, or commodity chemicals) such as chloralkalies, industrial gases, acids, salts, inorganic compounds, and rare earth metal salts. Industrial inorganic chemicals, n.e.c. (SIC 2819) account for about two-thirds of all inorganic chemical production.

The major consumers of inorganic chemicals are the automotive, housing, paper, packaging, pharmaceutical, paint and inks, and fertilizer industries. Demand for inorganic chemical products depends on the health of the economy generally and on these industries in particular.

Producers of inorganic chemicals are characterized by comparatively little research and development, declining productivity, and overcapacity. Only the most efficient producers are likely to survive in the long run. Company expansion is infrequent, and much effort is devoted to achieving economies in the cost of feedstocks, energy, and labor. In recent years, acquisitions, mergers, and consolidations have been frequent.

Trends and Forecasts: Industrial Inorganic Chemicals, Except Pigments (SIC 2812, 2813, 2819)

(in millions of dollars except as noted)

Item	1987	1988[1]	1989[2]	1990[2]	1991[3]	Percent Change 1987-88	1988-89	1989-90	1990-91
Industry Data									
Value of shipments[4]	17,377	19,294	18,874	20,451	—	11.0	3.0	2.9	—
Value of shipments (1987$)	17,377	18,342	18,893	19,432	20,005	5.6	3.0	2.9	2.9
Total employment (000)	85.3	87.2	90.4	93.6	—	2.2	3.7	3.5	—
Production workers (000)	45.0	47.0	49.5	52.1	—	4.4	5.3	5.3	—
Average hourly earnings ($)	14.99	13.64	—	—	—	−9.0	—	—	—
Product Data									
Value of shipments[5]	14,922	16,401	18,235	—	—	9.9	11.2	—	—
Value of shipments (1987$)	14,922	15,446	15,921	16,401	16,890	3.5	3.1	3.0	3.0

[1] Advance data from the 1988 Annual Survey of Manufactures.

[2] Estimate.

[3] Forecast.

[4] Value of all products and services sold by establishments in the industrial inorg. chem., except pigments industry.

[5] Value of products classified in the industrial inorg. chem., except pigments industry produced by all industries.

SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA). Estimates and forecasts by ITA.

INTERNATIONAL COMPETITIVENESS

Exports of inorganic chemicals rose nearly 15 percent between 1983 and 1984, reaching $3.3 billion. After a decline of nearly 7 percent between 1984 and 1985, exports rose by 3 percent in 1986, to $3.2 billion. In subsequent years, exports continued to rise, reaching an estimated $3.8 billion in 1990.

Imports declined consistently during this period, dropping by nearly 3 percent between 1984 and 1985 to just over $2.7 billion. Imports continued to decline in 1986 by another 7 percent to about $2.5 billion, and by 9 percent in 1987 to less than $2.3 billion. In 1988 imports reversed course, climbing to about $3.0 billion. They have remained at that level through 1989 and 1990.

Outlook for 1991

Constant-dollar industry shipments of inorganic chemicals are expected to rise moderately. At a time of low margins, growth will be limited because producers are reluctant to build new plants or bring old ones back on stream. Imports are expected to decline because of the weaker U.S. dollar, while exports will increase only slightly over the constant dollar level.

Long-Term Prospects

The inorganic chemicals industry is expected to grow at the modest rate of 2 percent a year through 1995. Demand for these products is tied directly to the state of the economy, particularly the housing, automobile, fertilizer, and pulp and paper industries. Diversification into the production of more profitable specialty and high-grade chemicals will continue but at a slow pace. Imports of inorganic chemicals should decline. Exports, on the other hand, will rise as the lower dollar increases foreign demand.

Alkalies and Chlorine

The chloralkalie industry (SIC 2812) produces mainly chlorine, caustic soda, soda ash, sodium bicarbonate, potassium hydroxide, and potassium carbonate. Chlorine and caustic soda account for about 86 percent of all shipments, while soda ash accounts for about 10 percent. The other four products account for less than 4 percent of the industry's shipments. All told, chloralkalies account for about 20 percent of shipments by the inorganic chemicals industry.

Almost one-third of the caustic soda produced is used to process organic chemicals. Another 25 percent is used to make pulp and paper, and the rest is used to manufacture a broad spectrum of industrial products. Soda ash is used mainly to manufacture glass and glass containers. It also is used in water treatment, pulp bleaching, and manufacturing detergents.

Chlorine and caustic soda are co-products, but the production of caustic soda has traditionally exceeded production of chlorine. Excess caustic soda is either exported or discarded. Excess chlorine, by contrast, is converted to organic chemicals, which are easier to store than chlorine.

Chlorine and caustic soda are made by electrochemical processes, and high energy costs have plagued producers. This has been particularly true in the case of the older diaphragm cell method. Now companies are turning increasingly to the membrane process, which consumes 20 to 30 percent less energy and produces chlorine and caustic soda of much higher purity.

For the past few years the chloralkalie industry has been buffeted by heavy offshore competition and waning demand for chlorine brought about by heightened environmental concerns. In response, production has declined, leading to smaller inventories and depressed profit margins. But producers are optimistic, looking forward to a modest but solid year.

Consumption of soda ash, on the other hand, is rising. It is increasingly being used as a substitute for caustic soda in bleaching processes, particularly for pulp and paper, and in chemical manufacturing. Soda ash exports are up, jumping nearly 15 percent in 1990. Eastern Europe holds out the greatest promise for export growth. The United States continues to have a favorable trade balance in alkalies and chlorine, maintaining a $5 million balance in 1990.

Outlook for 1991

The chloralkalie market should enjoy a modest but solid year, growing with the economy at slightly under 2 percent. Caustic soda demand is forecast to grow 1.5 percent for both the near and long term. Chlorine consumption is growing less quickly at about 1.1 percent, but producers expect chlorine demand to be vigorous enough because of new market opportunities in the polyvinyl chloride (PVC) sector. This should help stabilize supplies and pricing for caustic soda, while firming up prices and operating rates for the chloralkalie industry overall. Real growth in product shipments is expected to be less than 5 percent. Exports could potentially increase by as much as 2 percent, but imports will also increase because domestic supply cannot meet the expected high demand for chloralkalie products.

Long-Term Prospects

The long-term growth rate for alkalies and chlorine will probably continue at just under 2 percent for the next 3 to 4 years. Any possibility of greater growth will depend on a variety of factors, including the speed with which diaphragm cells are replaced by membrane cells. Further declines in the dollar, which would increase exports, also would affect growth, as would conditions in the automotive, paper, and glass industries.

Industrial Gases

The industrial gases industry (2813) produces gases in compressed, liquid, or solid form. They include oxygen, nitrogen, carbon dioxide, hydrogen, acetylene, and 80 to 100 specialty gases used for a variety of medical, communications, and aerospace purposes. Specialty gases constituted only about 5 percent of total industrial gas production in 1990, but they accounted for an estimated 24 percent of the industry's revenues. Not included in SIC 2813 are fluorine, sulfur dioxide, or sulfur hexafluoride, which are classified under SIC 2819, or ammonia, which is classified under SIC 2873.

The U.S. industrial gas industry continued to grow at 5 to 6 percent in 1990, and though fierce competition has kept prices and profits down in recent years, market growth has fueled extensive research in new large-scale applications and production. This should expand the market throughout the 1990s. Producers estimate the total U.S. industrial gas market at roughly $4.8 billion.

Among major consumers for industrial gases are the metals, chemical manufacturing, and electronics industries (oxygen); oil recovery, fertilizers and electronics (nitrogen); refrigeration, beverages, and chemical manufacturing (carbon dioxide); petroleum refining, chemical manufacturing, the NASA space program, and electronics (hydrogen); and metal fabrication and some chemical processes (acetylene).

Despite renewed strength in the market, competition and production and research costs are leading to consolidation. Four major producers dominate 90 percent of the U.S. market after a fifth producer dropped out in 1989.

INTERNATIONAL COMPETITIVENESS

U.S. exports of industrial gases increased 7.1 percent in 1990. Helium constitutes the bulk of the export trade, with oxygen and carbon dioxide accounting for a large share of the balance. Canada and Mexico purchased more than 50 percent of U.S. exports, while other large buyers include France, Belgium/Luxembourg, and the United Kingdom. As in the past, imports of industrial gases are included under SIC 2819 (industrial inorganic chemicals, n.e.c.).

Outlook for 1991

Measured in constant dollars, domestic demand for the major industrial gases—oxygen, nitrogen, and carbon dioxide—is expected to grow at 4 to 6 percent. Helium will register the greatest growth, expected to be 10 percent, because of its use in magnetic resonance imaging. The year should see higher operating rates, firmer prices, and improved profit margins. Exports of industrial gases should continue to expand, provided the dollar remains at its present level.

Long-Term Prospects

Industrial gas producers expect growth to continue at an overall rate of 4 to 6 percent throughout most of the 1990s. Prospects for long-term growth are good because of new large-scale applications of the basic industrial gases. For example, a new use has been found for oxygen, traditionally the industry leader, in pulp bleaching and waste treatment. Prospects are also good for nitrogen in such areas as food freezing and electronics. Carbon dioxide will experience strong growth and continue to dominate gas use in the food industry, and hydrogen is once again finding greater use in the space industry. Demand for specialty gases will increase in such fast-growing areas as electronics and medical diagnostics.

Industrial Inorganic Chemicals, N.E.C.

Industrial inorganic chemicals, n.e.c. (SIC 2819) include sulfuric, hydrochloric, and hydrofluoric acids; aluminum, potassium, and sodium salts; catalysts; calcium phosphates; activated carbon; hydrogen peroxide; elemental phosphorous and recovered sulfur. This industry is made up of almost 700 producers, half of which have fewer than 20 employees. These small companies concentrate on producing small-volume specialty chemicals and account for only about 4 percent of the industry's shipments.

Major users of these chemicals are the metals, motor vehicles, housing, pulp and paper, fertilizer, and soap and detergent industries. Following several years of lower growth, the industry's shipments have increased in recent years. Production has been consolidated to enable producers to make better use of existing capacity and tighten supplies sufficiently to support price increases.

In 1990, U.S. imports of these chemicals declined by 3 percent, while exports held steady at 1989 levels. The trade balance has been increasingly positive in the last few years largely because of the decline in the dollar, rising metal prices and production, and increased world demand for fertilizers. The demand for specialized chemicals is also driving the trade expansion. Most U.S. trade in industrial inorganic chemicals, n.e.c. is with Canada, the European Community, Australia, Japan, and Mexico.

Outlook for 1991

Several industries that are major users of industrial inorganic chemicals n.e.c. are expected to be stronger in 1991. As a result, industry shipments are expected to increase by 2 to 3 percent in value. Exports should increase slightly and imports should continue to decline.

Long-Term Prospects

Shipments by the industrial inorganic chemicals industry are expected to grow about 2 percent annually through 1994. Because these chemicals are used to produce other materials and products, their demand will depend on the health of U.S. industry in general. The general decline in demand that began a dozen years ago should reverse as the industries that use these chemicals gain strength, but growth is not expected to be rapid. Continued demand for higher-priced specialty industrial inorganic chemicals will offer the best prospects for growth in domestic sales and in U.S. exports as well.—*Anthony Kostalas, Office of Chemicals and Allied Products, (202) 377-0128.*

COATINGS AND ADHESIVES

Shipments of paints and coatings are expected to drop by 1 percent in constant dollars in 1991 because of declines in the architectural and original equipment sectors. Adhesives and sealants are expected to increase by 2 to 3 percent in constant-dollar terms in 1991.

In terms of quantity, total shipments of paints and coatings slowed in 1989. In terms of value, however, industry shipments in current dollars increased by nearly 8 percent. Available data indicate a significant shift toward higher-value products for the three major product categories: architectural coatings, original equipment manufacture (OEM) product coatings, and special-purpose coatings. Only the quantity shipped of special-purpose coatings grew in 1989 (nearly 5 percent over 1988), while architectural coatings remained stable and OEM product coatings declined by nearly 7 percent. In all three product classes, however, current value actually increased by at least 7 percent.

Interest in powder coatings continued to expand in 1990, partly as a result of research into environmentally safer application methods. Powder coatings, an alternative to older methods based on organic solvents, have lower disposal, labor, and energy costs. The United States lags at least 30 years behind Europe in the use of powder coatings and electrostatic coatings. Only in the 1980s did U.S. sales start to take off.

Growing demand for improved corrosion resistance has become critically important to original equipment manufacturing. The industry has responded by developing processes that combine high corrosion resistance and ease of application. These are known as electrodeposition processes, of which the new zinc-nickel coatings are a good example. Other methods, including chemical vapor deposition (CVD) and physical vapor deposition (PVD), have also gained attention as replacements for older methods still in use in aerospace and high-temperature applications.

The industry can be broadly divided into two groups: relatively few, large multinational and highly diversified companies, and a large number of regional paint companies not involved in significant trade. The major U.S manufacturers are Sherwin-Williams, Insilco, Valspar, Benjamin-Moore, Ameron, and the Grow Group.

Mergers and acquisitions continued in 1989 and 1990 as a number of highly diversified international concerns acquired entire companies and focused on the much sought-after advanced coatings divisions of U.S. domestic companies.

Other issues continued to occupy the industry's attention over the last year: revision of federal labelling requirements by the Occupational Health and Safety Administration; clean air legislation at the state level; amendments to the 1970 Clean Air Act; and reclassification of industry products under the new Harmonized Tariff Schedule. Department of Transportation restrictions on the use of certain organic chemical solvents and the regulation of toxic waste disposal under the Resource Conservation and Recovery Act remained on the industry's agenda in 1990.

INTERNATIONAL COMPETITIVENESS

Except for the high-valued speciality coatings, transportation costs have tended to inhibit trade in both directions. Imports of paints and coatings have remained fairly stable at around $100 million since 1985 and are growing faster than expected in 1990. The industrialized economies accounted for the bulk of imports through the first five months of 1990: Canada (27 percent), West Germany (18.4 percent), Japan (10.4 percent), and the United Kingdom (13.2 percent).

Exports peaked in 1988 and dropped in 1989, although there are signs that exports in the first five months of 1990 grew much faster than in the first five months of 1989. Canada stood out as the single largest market for the U.S. industry, accounting for an estimated 45 percent share in 1990. The remainder went to a large number of individually insignificant markets, each of which made up less than one percent.

Outlook for 1991

Overall shipments of coatings and adhesives are expected to decline by 1 percent in real terms. Architectural coatings will most probably decline in response to weak housing starts. Demand for original equipment coatings, particularly automobile-related uses, will continue to suffer as the demand for consumer durables declines. Exports of advanced coatings will probably grow to meet the demand of

Trends and Forecasts: Paints and Allied Products (SIC 2851)

(in millions of dollars except as noted)

Item	1987	1988[1]	1989[2]	1990[2]	1991[3]	Percent Change 1987-88	1988-89	1989-90	1990-91
Industry Data									
Value of shipments[4]	12,701	13,621	14,711	15,709	—	7.2	8.0	6.8	—
Value of shipments (1987$)	12,701	13,073	13,194	13,415	13,549	2.9	0.9	1.7	1.0
Total employment (000)	55.2	58.2	59.1	60.2	—	5.4	1.5	1.9	—
Production workers (000)	28.3	28.4	28.7	29.2	—	0.4	1.1	1.7	—
Average hourly earnings ($)	11.15	11.38	11.50	11.70	—	2.1	1.1	1.7	—
Capital expenditures	275	250	—	—	—	−9.1	—	—	—
Product Data									
Value of shipments[5]	12,079	12,946	13,975	14,924	—	7.2	7.9	6.8	—
Value of shipments (1987$)	12,079	12,456	12,613	12,832	12,961	3.1	1.3	1.7	1.0

[1] Advance data from the 1988 Annual Survey of Manufactures.

[2] Estimate.

[3] Forecast.

[4] Value of all products and services sold by establishments in the paints and allied products industry.

[5] Value of products classified in the paints and allied products industry produced by all industries.

SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA). Estimates and forecasts by ITA.

the new markets in Eastern Europe, as will opportunities for joint ventures and other direct investment. Barriers to U.S. imports in the form of standards are likely to become more pronounced as the proposed integration of the European economies progresses.

Long-Term Prospects

The so-called advanced or specialty coatings will continue to be in demand for the foreseeable future and account for a higher percentage of industry sales than in the past. Demand for all major types of coatings required by the reindustrialization of Eastern Europe will provide U.S. firms with numerous direct investment and joint-venture opportunities. Foreign investment in the U.S. industry does not show any signs of slowing down, and will probably continue.

ADHESIVES AND SEALANTS

The adhesives and sealants industry accounted for $5 billion to $6 billion in shipments in 1990. Although relatively small compared with other segments of the chemical industry (less than 2 percent), adhesives and sealants are incorporated into virtually every type of manufactured product.

The industry is broadly divided into two segments—the merchant and captive markets. In terms of value, the bulk of the industry's output is commonly referred to as the merchant market. It includes products formulated by the industry as well as small proportions of unformulated materials sold directly to end-users. More than 500 producers are estimated to be active in the merchant market. Those users that purchase adhesive and sealant raw materials and formulate their own products constitute the so-called captive market. In terms of value, the merchant market has tended to include a larger proportion of higher valued products than the captive end. Major merchant producers of adhesives are National Starch, H.B. Fuller, Loctite, 3M, and DuPont.

Over the last decade, industry concentration has not varied significantly. In 1987, the eight largest companies accounted for 34 percent of total sales, compared with 31 percent in 1982. Capacity utilization through the mid-1980s remained constant. Ownership, however, has changed considerably since 1985. In 1988 alone there were more than 200 acquisitions of mainly specialty firms. Mergers and acquisitions, largely by European-led concerns, continued in 1990 and resulted in an industry dominated by three major groups: specialty producers, diversified companies with main lines of business other than adhesives, and companies whose involvement with adhesives came as an offshoot of their chemical business.

End-user industries can be broadly divided into four categories: the consumer, manufacturing assembly, construction, and transportation markets. Currently, all four end-user markets depend heavily on acrylic and butyl rubber resins, while all except the consumer market rely heavily on a mix of polysulfide, polyurethane, and silicone resins.

INTERNATIONAL COMPETITIVENESS

Imports of adhesives and sealants slowed considerably in mid-1989 after strong growth in the preceeding two years. By mid-1990, however, imports reversed direction and were running nearly 19 percent higher than during the same period in 1989. The major suppliers of adhesives and sealants to the U.S. during the first five months of 1990 were Canada (15 percent), West Germany (26.6 percent) and Japan (38.4 percent). Other relatively minor but fast-growing suppliers included Sweden, Switzerland, and South Korea.

Exports of adhesives and sealants peaked in 1988, but after declining in 1989 rebounded in 1990. Nearly one-half of U.S. exports in 1990 went to three markets: Canada (31 percent), Japan (14 percent), and Mexico (8 percent). Exports to a large number of small markets accounted for the remainder.

Outlook for 1991

Total industry shipments of adhesives and sealants in real terms are projected to increase 2 to 3 percent through 1991. Demand for adhesives will most likely slow down as a result of weaker demand from packaging, manufacturing, and wood bonding end-users, but higher-than-average growth is expected for biomedical/dental, electrical assembly, and transportation end-users. Sharp downturns in housing starts are likely to depress demand for architectural sealants. Declines in consumer spending will translate into weaker demand for sealants used in the consumer, packaging, and manufacturing sectors in 1991.

Long-Term Prospects

Higher-than-average growth rates for specialty adhesives and sealants are expected to exceed the industry average well

Trends and Forecasts: Adhesives and Sealants (SIC 2891)

(in millions of dollars except as noted)

						Percent Change			
Item	1987	1988[1]	1989[2]	1990[2]	1991[3]	1987-88	1988-89	1989-90	1990-91
Industry Data									
Value of shipments[4]	4,678	4,872	5,350	5,832	—	4.1	9.8	9.0	—
Value of shipments (1987$)	4,678	4,577	4,681	4,812	4,932	−2.2	2.3	2.8	2.5
Total employment (000)	20.9	21.2	21.8	22.0	—	1.4	2.8	0.9	—
Production workers (000)	11.8	11.8	11.9	12.0	—	0.0	0.8	0.8	—
Average hourly earnings ($)	10.59	11.03	11.58	12.20	—	4.2	5.0	5.4	—
Capital expenditures	112	85.1	—	—	—	−24.0	—	—	—
Product Data									
Value of shipments[5]	4,550	4,879	5,296	5,770	—	7.2	8.5	9.0	—
Value of shipments (1987$)	4,550	4,523	4,589	4,718	4,835	−0.6	1.5	2.8	2.5

[1] Advance data from the 1988 Annual Survey of Manufactures.

[2] Estimate.

[3] Forecast.

[4] Value of all products and services sold by establishments in the adhesives and sealants industry.

[5] Value of products classified in the adhesives and sealants industry produced by all industries.

SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA). Estimates and forecasts by ITA.

into the 1990s. Mergers and acquisitions by multinational concerns will continue to provide specialty adhesives firms with the required level of R&D funds to survive in these highly competitive markets. Radiation curing and organic solvent-free formulations will probably gain ground at the expense of solvent-based products.—*Raimundo Prat, Office of Basic Industries, (202)377-0128, August 1990.*

Additional References

(Call the Bureau of the Census at (301) 763-4100 for information about how to order Census documents.)

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Paints and Allied Products, 1987 Census of Manufactures, MC87-I-28E(P); *Miscellaneous Chemical Products*, 1987 Census of Manufactures, MC87-I-28H(P). Bureau of the Census, U.S. Department of Commerce, Washington, DC 20233.

Current Industrial Reports: Paint, Bureau of the Census, U.S. Department of Commerce, Washington, DC 20233.

American Paints and Coatings Journal, 2911 Washington Avenue, St. Louis MO 63103. Telephone: (314) 534-0301.

Adhesives Age, 6255 Barfield Road, Atlanta, GA 30328. Telephone: (404) 256-9800.

The Rauch Guide to the U.S. Adhesives and Sealants Industry, Rauch Associates, Inc., P.O. Box 6802, Bridgewater, NJ 08807. Telephone: (201) 231-9548.

National Paint and Coatings Association, Washington, DC. Telephone: (202) 462-6272.

AGRICULTURAL CHEMICALS

Shipments of nitrogenous and phosphatic fertilizers and pesticides are expected to increase 4.1 percent in constant dollars in 1991. Industry shipments should go up 5.9 percent. Shipments of nitrogenous fertilizers made up 23 percent of the total. Phosphatic fertilizer shipments contributed 30 percent, and pesticides accounted for 47 percent.

Fertilizers

The fertilizer industry produces nitrogenous, phosphatic and potassic (potassium) fertilizers, which supply primary nutrients needed by plants. The basic nitrogen fertilizer is ammonia, which is made from natural gas and nitrogen. Ammonia can be applied as a liquid or converted into solid nitrogenous fertilizers such as urea. Phosphoric acid, made from phosphate rock and sulfuric acid, is the source of almost all of the phosphatic fertilizer used in agriculture. Diammonium phosphate, the only major fertilizer containing two nutrients (nitrogen and phosphorous), is classified as a phosphatic fertilizer. The major potassic fertilizer is potassium chloride, more commonly called potash; data on potassium chloride are included with inorganic chemicals n.e.c. (SIC 2819). Fertilizer chemicals based on nitrogen account for 53 percent of total fertilizer consumption in the United States; those based on phosphorous, 26 percent and potassic fertilizers, 21 percent.

The leading world fertilizer producers are the United States, the Soviet Union, China, and Canada. The United States leads in phosphate production, followed by Morocco. The Soviet Union leads in ammonia production, followed by China and the United States. Canada and the Soviet Union share the lead in potash.

Because of demand and cost pressures, the number of fertilizer and pesticide companies in the United States has declined sharply in recent years. Economic trends, climatic conditions, and government programs aimed at reducing planted acreage directly affect demand for agricultural chemicals. Fertilizer producers also have faced high raw material costs.

The U.S. fertilizer industry is also sensitive to other domestic developments, including proposed groundwater legislation at the state and Federal levels, which would regulate the use of commercial fertilizers, and U.S. Government funding of producing facilities overseas, which ultimately will tend to depress world fertilizer prices.

INTERNATIONAL COMPETITIVENESS

The high price of natural gas prevents the U.S. nitrogenous fertilizer industry from returning to a dominant position in world trade. The U.S. phosphate fertilizer industry also is losing share in the world market to Morocco, whose raw material resources surpass those of the United States in both quantity and quality.

Nitrogenous Fertilizers

For the last several years, and especially in 1989 and 1990, the nitrogen fertilizer industry (SIC 2873) has been undergoing a restructuring, mainly to reduce costs in response to competition from low-priced imports, weak domestic and world prices, and excess supply. As a result, industry concen-

Trends and Forecasts: Agricultural Chemicals, Except Fertilizer Mixing (SIC 2873, 2874, 2879)

(in millions of dollars except as noted)

Item	1987	1988[1]	1989[2]	1990[2]	1991[3]	Percent Change 1987-88	1988-89	1989-90	1990-91
Industry Data									
Value of shipments[4]	12,568	14,095	15,149	15,416	16,635	12.1	7.5	1.8	7.9
Value of shipments (1987$)	12,568	12,952	13,597	13,612	14,409	3.1	5.0	0.1	5.9
Total employment (000)	32.8	33.7	34.0	34.2	34.1	2.7	0.9	0.6	−0.3
Production workers (000)	19.7	20.4	20.7	21.0	20.9	3.6	1.5	1.4	−0.5
Average hourly earnings ($)	13.35	13.42	13.76	14.06	—	0.5	2.5	2.2	—
Capital expenditures	335	513	—	—	—	53.1	—	—	—
Product Data									
Value of shipments[5]	11,944	13,711	14,472	15,392	16,324	14.8	5.6	6.4	6.1
Value of shipments (1987$)	11,944	12,546	13,102	13,616	14,169	5.0	4.4	3.9	4.1

[1] Advance data from the 1988 Annual Survey of Manufactures.

[2] Estimate.

[3] Forecast.

[4] Value of all products and services sold by establishments in the agr. chemicals, except fertilizer mixing industry.

[5] Value of products classified in the agr. chemicals, except fertilizer mixing industry produced by all industries.

SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA). Estimates and forecasts by ITA.

Fred Myers/TVA

Dry fertilizer being transferred to applicator. Shipments of nitrogenous and phosphatic fertilizers and pesticides are expected to increase 4.1 percent in constant dollars in 1991.

tration is increasing. Three companies out of a total of 29 now account for 37 percent of total U.S. ammonia capacity.

The current-dollar value of nitrogenous fertilizer shipments is estimated at $3.8 billion in 1990, compared with $3.6 billion for 1989. Consumption was up almost 2 percent. There was no significant change in production. Inventory reductions account for the 5 percent increase in real growth of product shipments. Exports remained about the same. Foreign prices were unsteady and domestic prices too low, so that the percentage change in real growth as well as the change in current dollars from 1989 to 1990 was about the same.

Outlook for 1991

Consumption is forecast to rise 3 percent over 1990, a reflection of increased acreage in the set-aside participation program. With no allowance for inventory change, with imports and exports expected to remain the same, and with a significant increase in prices both here and abroad, product shipments are forecast to increase 5 percent and real growth 3 percent.

Long-Term Prospects

Nitrogenous fertilizer product shipments will probably continue to increase about 1 percent per year during the next five years. Additional demand will be filled by domestic plants to the modest extent they will be able to when not operating at full capacity; however, most of the additional supply will continue to come from abroad, mostly from the Western Hemisphere. U.S. ammonia capacity should continue to drop as old plants are retired. The price of natural gas is expected to continue to rise for the next five years, from a spot-price of about $2.50 per thousand cubic feet (MCF) to between $4.50 and $5.00 per MCF by 1995. At $2.50, gas for U.S. ammonia accounts for almost 80 percent of total production cost.

Because of the high price domestic ammonia producers must pay for natural gas, imports have been substantially greater than exports for the past seven years. The situation is not expected to change in the foreseeable future. For the same reason, no new ammonia plant is expected to be built in the United States.

Phosphatic Fertilizers

U.S. production of phosphoric acid, the basis of almost all phosphatic fertilizers (SIC 2874), increased from 9.6 million short tons (77 percent of capacity) in 1986 to 10.7 million tons (94 percent of capacity) in 1987; to 11.7 million tons (98 percent of capacity) in 1988; then declined to 11.6 million tons (97 percent of capacity), in 1989; and recovered to 11.8 million tons (99 percent of capacity) in 1990.

The United States leads the world in both consumption and production of phosphate fertilizers, followed in consumption by the Soviet Union and by Morocco in production. According to Bureau of Mines estimates, world phosphate rock reserves total 14.6 billion short tons, 54 percent of which is in Morocco; the United States and the Soviet Union each have 10 percent of world reserves.

INTERNATIONAL COMPETITIVENESS

World trade is a key factor for the U.S. phosphate industry. The industry is very export intensive, with about half of U.S. production going to exports. Morocco exports an even greater percentage of its production, but it is second to the United States in export tonnage of phosphate fertilizer. Diammonium phosphate (DAP) acounts for more than 90 percent of U.S. phosphate exports. From 1989 through 1990, China and India were the leading consumers of U.S. DAP, accounting for more than 50 percent of U.S. exports. DAP exports increased almost 15 percent in crop year 1990 over 1989, all of which went to China and India.

The current-dollar value of phosphatic fertilizer product shipments in 1990 is estimated at $4.6 billion, compared with $4.1 billion for 1989. Consumption in 1990 was almost 2 percent over 1989. There was a comparable increase in production, with no significant change in inventories. Exports were up, accounting for more than 50 percent of total shipments. Imports were not significant. Domestic prices remained depressed over 1989, with signs of some recovery apparent by the end of the year, while improved overseas pricing became apparent earlier in the year. The net result was a 10 percent increase in current-dollar product shipments and a 7 percent increase in real growth.

Outlook for 1991

Consumption is expected to increase 1 to 2 percent over 1990. Production will by higher because exports are expected to continue to grow, accounting for more than 50 percent of total shipments. Real growth in product shipments should exceed 1990 shipments by 5 percent. With bullish pricing expected both here and abroad, phosphate fertilizer product shipments should increase by 10 percent over 1990.

Long-Term Prospects

Morocco is expected to become a significant supplier of phosphatic fertilizers in the 1990s. Although the United States will continue to lead in world phosphate supply and consumption, the U.S. share of the world market will drop as Morocco commercializes more of its dominant phosphate rock resources.

Pesticides

Pesticides are classified in SIC 2879, agricultural chemicals, n.e.c., which are made up of pesticide preparations or formulations; and in SIC 28694, pesticide and other organic agriculatural chemicals, which are active ingredients that can be used to formulate pesticides. All of the components of SIC 2879 and SIC 28694 are organic chemicals and account for more than 95 percent of the active ingredients of pesticide products. Virtually all of the technological progress and resulting productivity gains in pesticides have come about through improvements in the use of organic chemicals.

The 1989 edition of the SRI International Directory of Chemical Producers identifies 219 separate chemicals. Of this total, 41 percent are herbicides and plant-growth regulators, 26 percent insecticides, 22 percent fungicides, and 11 percent other (such as fumigants and repellants). From these chemicals and a few foreign pesticide active ingredients, U.S. companies and foreign competitiors have registered 50,000 formulated pesticide products in the United States.

Herbicides have been growing at a greater rate than either insecticides or fungicides. Based on retail prices, U.S. farmers have been consuming almost $5 billion worth of pesticides, more than 60 percent as herbicides and about 5 percent as miscellaneous other pesticides.

INTERNATIONAL COMPETITIVENESS

Exports have exceeded imports by a ratio of about 6 to 1. Exports have been about $1.6 billion during the past five years, and imports almost $0.3 billion.

Certain countries merit special attention. The United States is the world's leading producer and consumer of pesticides, followed by West Germany and Japan. But Japan, the third largest consumer of U.S. pesticides, accounting for almost 10 percent, represents only 5 percent of U.S. imports. The positive trade balance with Japan has been about 11 to 1, but there are indications of a downward trend. Germany accounts for 23 percent of U.S.imports but only 3 percent of exports. Trade with Germany is balanced in dollar terms, but eventually the balance is expected to favor Germany. Four countries—Australia, Colombia, France, and Hong Kong—together account for 16 percent of U.S. exports, but the rate of increase of exports to these four countries is high enough to put them among the leading consumers of U.S. pesticides in the early 1990s.

The U.S. pesticide industry of the 1980s was characterized by restructuring and environmental constraints. Consolidation of production facilities among fewer companies continued in 1990 because of the increasing cost of R&D, the abuse of intellectual property rights, and environmental regulations. The high cost of stringent toxicity tests in compliance with environmental regulations and the increasing difficulty of finding new products have boosted R&D costs for a single new pesticide to more than $50 million, compared with an average cost of $6 million in 1976. In the process, average development time has lengthened to 9 years.

Emphasis on carcinogenicity has shifted from pesticides to the food that is treated with pesticides. A number of food safety bills were introduced in Congress in 1989 and 1990. All of the bills would virtually eliminate the Delaney Clause as it applies to carcinogenic pesticide residues in processed products. (The Delaney Clause, which dates to 1958, amends the Food, Drug, and Cosmetics Act by prohibiting the use of cancer-causing additives that leave residues on food.) Regulation of direct food additives would not be affected. If the residue becomes more concentrated during processing and is found to exceed tolerance levels in the finished food, its use is prohibited under the Delaney Clause. Under current law, the Environmental Protection Agency (EPA) is permitted to establish a tolerance level for a carcinogenic pesticide residue on raw agricultural commodities. Processed foods may contain the residue, provided it does not exceed the tolerance level set for the raw product.

The chief argument being made for eliminating the Delaney Clause is that it has been made obsolete by new technology, which makes it possible to detect carcinogens at levels too minute to present a risk to humans.

Product shipments reached $ 6.9 billion in 1990, an increase of 3 percent over 1989. Real growth was 1.5 percent, about the same as consumption growth. Exports accounted for more than 25 percent of total 1990 shipments.

Outlook for 1991

The constant-dollar value of product shipments is expected to increase only about 1 percent because of more effective use of pesticides, which tends to decrease cost per acre treated; violations of U.S. intellectual property rights in world markets, and pressures on U.S. farmers to reduce use of toxic chemicals that are thought to pollute ground water.

As an example of other changes that may lie in store, one U.S. firm claims to be on the verge of developing a genetically engineered corn that is resistant to insects. If successful, it would virtually eliminate the need for using insecticides on corn.

Long-Term Prospects

The biggest challenges to the agriculture industry are food safety, which has become a growing political issue, and a negative environmental image, much of which is based on improper documentation. Indeed, environmental concerns can be expected to grow significantly over the decade. Meanwhile, the industry is developing safer products, and its communications with consumers are also getting better, which help to improve handling and application of pesticides. Long-term, the industry's challenge is to continue to provide the American public with the cheapest, safest, and most nutritious food in the world.

The world market for pesticides is about $22 billion, based on wholesale prices. Growth is forecast at 2.5 to 3.0 percent per year. North America and Western Europe account for close to 60 percent of the world market.

The U.S. pesticide market is expected to grow 1 percent over the next five years. By comparison, the growth rate for Brazil, the Soviet Union, India, and Spain should each reach four percent per year. The United States, however, will continue to remain the largest consumer, with a market valued at $5.7 billion by 1995, compared with second-place Japan's $2.9-billion market. The Soviet Union should rank fourth at $1.2 billion, followed by Brazil, $1.2 billion; India, $665 million, and Spain, $655 million. Markets in France, Japan, Germany, and the United Kingdom are expected to remain flat.—*Frank Maxey, Office of Chemicals and Allied Products, (202) 377-0128, August 1990.*

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(Call the Bureau of the Census at (301) 763-4100 for information about how to order Census documents.)

Inorganic Fertilizer Materials and Related Products, M28B, Bureau of the Census, U.S. Department of Commerce, Washington, DC 20230. Telephone: (301) 763-7807.

Synthetic Organic Chemicals, U.S. Production and Sales, U.S. International Trade Commission, Washington, DC 20436. Telephone: (202) 252-1363.

U.S. Exports and U.S. Imports, International Trade Administration, U.S Department of Commerce, Washington, DC 20230. Telephone: (202) 377-0128.

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Plastics and Rubber

Constant dollar industry shipments for plastics and rubber materials and products are forecast to increase by 0.8 percent in 1991. Plastics and rubber materials (SIC 2821, 2822) are projected to increase 0.9 percent, while rubber products (SIC 3011, 3021, 3052, 3069, 308 excluding 3085) are estimated to increase by 0.7 percent.

This chapter covers a varied group of materials and products of the plastics and rubber industries, including plastic (SIC 2821) and synthetic rubber (SIC 2822) resins, tires (SIC 3011), rubber and plastics footwear (SIC 3021), rubber and plastics hose and belting (SIC 3052), fabricated rubber products (SIC 3069), and miscellaneous plastic products (SIC 308).

Reclassification of the Standard Industrial Classification in 1987 led to elimination of SIC 3079 and to creation of SIC 308. SIC 308 has been expanded to include the following: unsupported plastics film and sheet, unsupported plastics profile shapes, laminated plastics plates and sheet, plastics pipe, plastic bottles (not covered in this chapter), plastics foam products, custom compounding of purchased resins, plastics plumbing fixtures and plastics products not elsewhere classified.

Before reading this chapter, please see "How to Get the Most Out of This Book" on page 1. It will clarify questions you may have concerning data collection procedures, factors affecting trade data, forecasting methodology, the use of constant dollars, the difference between industry and product data, sources and references, and the Standard Industrial Classification system (SIC). For other topics related to this chapter, see chapters 5 (Housing and Construction), 11 (Cans and Containers: Plastic Bottles), 12 (Chemicals), 18 (Advanced Materials: Engineering Plastics), 35 (Leather and Leather Products: Shoes and Slippers), 37 (Motor Vehicles and Parts: Automotive Parts and Accessories), 38 (Household Consumer Durables: Lawn and Garden Equipment), and 39 (Personal Consumer Durables: Sporting and Athletic Goods).

PLASTICS MATERIALS

The plastics materials industry (SIC 2821) experienced modest gains from mid-1989 through 1990. Shipments reflected a slight increase.

Plastics make up the largest category of materials used in the United States today, as they continue to displace metal, glass, paper, wood, and other materials. These new market applications result from new technologies which give plastic such qualities as high temperature resistance, high strength-to-weight ratios, and chemical/corrosive resistance.

Packaging industries continue to be the largest consumers of plastics materials, followed by transportation, electronic, construction, medical equipment, and sporting goods industries.

Plastic resins are produced by processing petrochemical feedstocks and intermediate chemicals. Ethylene is the major feedstock utilized, followed by benzene and propylene.

The two major categories of plastics are thermosets (i.e., phenolic, urea and melamine, polyurethane, polyester, unsaturated), and thermoplastics (i.e., polycarbonate, polyvinyl chloride). Thermosets plastics as products are substantially more infusible and insoluble than thermoplastics and cannot be softened by heat. Thermoplastics, on the other hand, can

Trends and Forecasts: Plastics Materials and Resins (SIC 2821)

(in millions of dollars except as noted)

						Percent Change			
Item	1987	1988[1]	1989[2]	1990[2]	1991[3]	1987-88	1988-89	1989-90	1990-91
Industry Data									
Value of shipments[4]	26,246	32,097	32,939	33,268	—	22.3	2.6	1.0	—
Value of shipments (1987$)	26,246	26,212	26,736	27,224	27,496	−0.1	2.0	1.8	1.0
Total employment (000)	56.3	59.5	59.4	59.3	—	5.7	−0.2	−0.2	—
Production workers (000)	34.9	36.9	39.0	39.5	—	5.7	5.7	1.3	—
Average hourly earnings ($)	15.24	15.38	—	—	—	0.9	—	—	—
Capital expenditures	1,247	1,634	—	—	—	31.0	—	—	—
Product Data									
Value of shipments[5]	27,812	33,878	34,741	35,088	—	21.8	2.5	1.0	—
Value of shipments (1987$)	27,812	28,388	28,927	29,486	29,781	2.1	1.9	1.9	1.0

[1] Advance data from the ***1988 Annual Survey of Manufactures***.

[2] Estimate.

[3] Forecast.

[4] Value of all products and services sold by establishments in the plastics materials and resins industry.

[5] Value of products classified in the plastics materials and resins industry produced by all industries.

SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA). Estimates and forecasts by ITA.

be repeatedly softened or hardened by increasing or decreasing the temperature.

Plastics that are produced in large quantities and at low cost, with prices influenced by the cost of feedstock, are known as commodity resins. These include polyvinyl chloride, polyethylene, polypropylene, and polystyrene resins. Plastics produced in small quantities at a relatively high cost, due to a high technology production process, are referred to as engineering resins. These include polyacetal, polyamide imide, polyarylate, polyether imide, polyethersulfone, polyphenylenesulfide, polysulfone, polycarbonate, fluoropolymers, polyimide, alloys, and blends. The data in this chapter cover both commodity and engineering plastics. For additional information, see chapter 18, (Advanced Materials: Engineering Plastics).

Weakened demand in 1990 for plastics material reflected the softening of the U.S. economy, particularly in the construction and the automotive sectors. In addition, increased feedstock availability and expanded resins capacity slackened the supply-demand ratio. As a result, 1990 industry shipments were relatively flat.

To help sustain growth and address the issue of plastics waste, the plastics industry is devoting increased resources to research more efficient recycling technologies. Recycled (regrind) plastics are lower in cost than virgin plastics and are used in a wide variety of products, such as automotive bumpers, windbreakers, and surfboards.

The recycling industry is likely to experience a surge in interest and commercial applications if oil prices rise, making petroleum-based feedstocks more expensive.

INTERNATIONAL COMPETITIVENESS

The United States leads in production and export of plastics; plastics account for a significant portion of the chemical industry net surplus.

Plastics News

Supplies of recycled resins are expected to increase more than 47 percent between 1990 and 1991 and more than 20 percent annually between 1991 and 1993. Resins can be baled, flaked, or formed into pellets. Here, resin pellets from recycled soda bottles are ready for a variety of applications, including packaging, pipe and pipe fittings, and extruded board.

Resin trade continues to enjoy a period of strong export sales, despite the fact that the surplus decreased slightly in 1990.

In 1990, exports rose 2.2 percent, while imports rose 5.7 percent, for an estimated net trade surplus of $4.1 billion. The largest markets in 1990 were Canada, Japan, Mexico, the United Kingdom, and The Netherlands. The leading U.S. suppliers were Japan, Taiwan, Canada, South Korea, and West Germany. Current levels for both imports and exports are more than double their 1985 levels.

U.S. Exports and Imports
Plastics and Selected Products

(in millions of dollars except as noted)

SIC	Industry	1989	1990[1]	1991[2]	Percent Change 1989-90	Percent Change 1990-91
2821	Plastics materials and resins					
	Value of exports	5,606	5,729	5,840	2.2	1.9
	Value of imports	1,551	1,640	1,750	5.7	6.7
2822	Synthetic rubber					
	Value of exports	868	1,135	1,305	30.8	15.0
	Value of imports	527	520	535	−1.3	2.9
3011	Tires and inner tubes					
	Value of exports	854	1,110	1,315	30.0	18.5
	Value of imports	2,667	2,707	2,806	1.5	3.7
3021	Rubber and plastics footwear					
	Value of exports	19.4	23.3	25.5	20.1	9.4
	Value of imports	467	513	545	9.9	6.2
3052	Rubber & plastics hose & belting					
	Value of exports	314	390	450	24.2	15.4
	Value of imports	481	514	534	6.9	3.9
3069	Fabricated rubber products, nec					
	Value of exports	459	652	783	42.0	20.1
	Value of imports	750	691	695	−7.9	0.6
308	Miscellaneous Plastics Products, nec					
	Value of exports	3,004	3,776	4,455	25.7	18.0
	Value of imports	3,605	3,815	4,006	5.8	5.0
	Plastics & Selected Products					
	Value of exports	11,125	12,815	14,174	15.2	10.6
	Value of imports	10,048	10,400	10,871	3.5	4.5

[1] Estimate. [2] Forecast.

SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA). Estimates and forecasts by ITA.

Outlook for 1991

U.S. plastics producers should experience a good year in 1991. However, depending upon events in the Middle East, profit margins may shrink. In addition, as the automotive and construction markets remain flat, plastic industry growth will be slower than the rapid pace of the mid-1980s.

Export sales may rise slightly in 1991, with imports rising at a stronger clip.

Long-Term Prospects

During the early 1990s, overall demand for plastics materials should grow 2 percent a year. Future development of new alloys, blends, additives, and composites will foster new applications for plastics and support this growth.

U.S. licensing and joint ventures will increase in Mexico, as the Mexican government relaxes its foreign investment regulations. In addition, Eastern Europe may be fertile ground for joint ventures, as capitalism takes root.

Many U.S. companies with multinational focus will adapt to the changes that come with EC92 by investing more in facilities in Europe, rather than exporting plastic resins. EC92 is the merger of the economies of 12 Western European

Novophalt America Inc

One of the most interesting uses of recycled plastics is Novophalt, a blend of polyolefins, primarily polyethylene, used as a binding material in paving-grade asphalt cement. This material has been used in Austria, Italy, Spain, and Saudi Arabia since 1982, and is gaining acceptance in North America.

countries, which constitute a single market of 325 million people with a Gross Domestic Product of $4.5 trillion and a per capita income of $13,770 in 1988. Although not expecting to be fully operational until 1992, the EC member countries are already gearing up for competition with other world markets.

The U.S. plastics industry should retain its technological lead in the global marketplace. Nevertheless, the major challenge facing the industry will be that of resource recovery in the 1990s.—*Moira M. Shea, Office of Chemicals and Allied Products, (202) 377-0128, August 1990.*

U.S. Trade Patterns in 1989
Plastics and Selected Products
SIC 2821, 2822, 301, 302, 3052, 3069, 308
(in millions of dollars, percent)

Exports	Value	Share	Imports	Value	Share
Canada & Mexico	3,331	29.9	Canada & Mexico	2,530	25.2
South America	652	5.9	South America	253	2.5
European Community	2,278	20.5	European Community	1,681	16.7
East Asia NICs	1,721	15.5	East Asia NICs	2,530	25.2
Japan	961	8.6	Japan	1,887	18.8
Other	2,183	19.6	Other	1,168	11.6
World Total	11,125	100.0	World Total	10,048	100.0

Top Five Countries

	Value	Share		Value	Share
Canada	1,976	17.8	Canada	2,151	21.4
Mexico	1,355	12.2	Japan	1,887	18.8
Japan	961	8.6	Taiwan	1,032	10.3
Belgium	694	6.2	West Germany	720	7.2
United Kingdom	499	4.5	South Korea	608	6.1

See "How to Get the Most Out of This Book" for definitions of the Country Groupings.
SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA).

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Plastics News, Crain Communications, Inc., 965 E. Jefferson, Detroit, MI 48207-3185. Telephone: (313) 446-6000.

Chemical Marketing Reporter, Schnell Publishing Company, Inc. 80 Broad Street, New York, NY 10004-2203. Telephone: (212) 248-4177.

SYNTHETIC RUBBER

Synthetic rubber is made by polymerization or copolymerization of materials known as elastomers, which are rubber-like materials capable of undergoing vulcanization. This SIC group 2822 includes the following synthetic rubber materials: copolymers of butadiene and styrene; copolymers of butadiene and acrylonitrile; polybutadiene; and chloroprene. These resins are typically used as substitutes for natural rubber when flexibility and durability are required.

Butadiene, EPDM, and styrobutadiene rubber (SBR) in various forms (emulsion, solution, and carboxylated latex), account for the bulk of production. An estimated three-quarters of U.S. domestic SBR output is absorbed by tire manufacturing. SBR is also used in the building/construction, auto hose and belting, wire/cable, footwear, and adhesives industries. Certain synthetic rubber resins, including EPDM, are also used in combination with natural or other synthetic rubber resins.

Demand for synthetic rubber resins is strongly influenced by technological trends in tire manufacturing. The transition from bias-ply design (89 percent synthetic rubber, 11 percent natural) to radial-ply (84 percent synthetic, 16 percent natural) and high-performance (83 percent synthetic, 17 percent natural) during the 1970s and early 1980s has translated into lower demand for SBR resins in favor of natural rubber. Natural rubber is softer and more pliable, but wears more quickly. This trend, however, has been partially offset by the larger size of radial tires, which use more of both kinds of materials, and which are increasingly popular because of their comfortable ride.

Imports of synthetic rubber resins have been growing steadily since the 1986 low of $295 million and are presently at about the same level as one year ago. Canada (39.7 percent), France (8.1 percent), Japan (11.1 percent), and The Netherlands (7.5 percent) account for the bulk of U.S. imports.

Exports of synthetic rubber dropped sharply in 1989 but appear to be recovering; major markets in 1990 were the industrialized economies of Belgium-Luxembourg (29.8 percent), Canada (19.1 percent), and The Netherlands (7.3 percent). Other smaller markets by mid-1990 were Brazil, France, and Mexico.

Outlook for 1991

Real growth in synthetic rubber is not expected to exceed 1 percent as a result of dropoffs in demand from the automobile tires and replacement parts industries. Consumption of thermoplastic resins and other versatile resins used in sophisticated composite and bonding formula-

Trends and Forecasts: Synthetic Rubber (SIC 2822)

(in millions of dollars except as noted)

Item	1987	1988[1]	1989[2]	1990[2]	1991[3]	Percent Change 1987-88	1988-89	1989-90	1990-91
Industry Data									
Value of shipments[4]	3,283	4,091	4,445	4,579	—	24.6	8.7	3.0	—
Value of shipments (1987$)	3,283	3,753	4,015	4,096	4,116	14.3	7.0	2.0	0.5
Total employment (000)	10.4	11.3	11.8	12.0	—	8.7	4.4	1.7	—
Production workers (000)	6.7	7.1	7.4	7.6	—	6.0	4.2	2.7	—
Average hourly earnings ($)	15.88	16.36	—	—	—	3.0	—	—	—
Capital expenditures	171	216	—	—	—	26.3	—	—	—
Product Data									
Value of shipments[5]	3,467	4,049	4,241	4,455	—	16.8	4.7	5.0	—
Value of shipments (1987$)	3,467	3,658	3,841	3,996	4,074	5.5	5.0	4.0	2.0

[1] Advance data from the 1988 Annual Survey of Manufactures.

[2] Estimate.

[3] Forecast.

[4] Value of all products and services sold by establishments in the synthetic rubber industry.

[5] Value of products classified in the synthetic rubber industry produced by all industries.

SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA). Estimates and forecasts by ITA.

tions, however, will probably grow faster than the industry as a whole.

Long-Term Prospects

Demand will depend on the technologies that become available for recycling tires, and also on how quickly the use of synthetic rubber and other elastomers progresses in the automobile parts industries. Growth is not expected to exceed 1.5 percent in real terms over the next five years for bulk resins, but demand for advanced thermoplastic elastomers will probably grow in tandem with specialty adhesives and composite materials. Recent increases in petroleum prices will make themselves felt in the early 1990s. Canada will remain the largest U.S. supplier for the foreseeable future.

PRODUCTS

The following products are made from varying proportions of natural, synthetic, and recycled rubber. Natural rubber consists of raw natural latex from rubber trees. It is highly flexible, but wears quickly. Natural rubber is usually blended with synthetic rubber resins derived from petroleum, and with recycled materials from used tires, etc. Synthetic resins add strength and resistance to harsh temperatures and chemicals. Recycled materials are less flexible and durable, but are lower cost.

INNER TUBES

This industry includes the manufacture of pneumatic casings; inner tubes; solid and cushion tires for all types of vehicles, airplanes, farm equipment, and recreational vehicles; tiring; camelback; and tire repair and retreading materials.

Foreign acquisitions of major U.S. companies has accelerated over the last 2 to 3 years and led to a significant foreign presence. Five major U.S. tire companies have either merged or been acquired since 1987. The U.S. industry now consists of two main groups: a few large, diversified tire companies with ties to multinational concerns, and a limited number of wholly U.S.-owned tire manufacturers with private labels. While firms struggle to maintain market share, consumers benefit from competitive pricing for most tire products.

One factor weighing heavily on the industry is the recycling of used tires. A lack of consensus at the Federal level on recycling has resulted in a maze of state proposals which attempt to alleviate the problem through taxation at the point of sale or disposal. Other proposed tire recycling legislation calls for tire manufacturers to partially subsidize the recycling of scrap tires to come up with suitable levels of recyclable rubber materials. States with sizable quantities of used tires have commissioned studies to find alternative uses for crushed or shredded rubber, such as landfill and road coverings. Although technically feasible, a number of presently available recycling technologies (pyrolysis, chem-

Trends and Forecasts: Tires and Inner Tubes (SIC 3011)

(in millions of dollars except as noted)

Item	1987	1988[1]	1989[2]	1990[2]	1991[3]	Percent Change 1987-88	1988-89	1989-90	1990-91
Industry Data									
Value of shipments[4]	10,427	11,240	12,031	12,582	—	7.8	7.0	4.6	—
Value of shipments (1987$)	10,427	10,743	11,119	11,397	11,511	3.0	3.5	2.5	1.0
Total employment (000)	65.4	67.7	67.3	65.9	—	3.5	−0.6	−2.1	—
Production workers (000)	52.6	54.6	54.3	52.2	—	3.8	−0.5	−3.9	—
Average hourly earnings ($)	15.39	15.57	—	—	—	1.2	—	—	—
Capital expenditures	337	418	—	—	—	24.0	—	—	—
Product Data									
Value of shipments[5]	10,033	10,843	12,113	12,057	—	8.1	11.7	−0.5	—
Value of shipments (1987$)	10,033	10,471	11,384	11,216	11,385	4.4	8.7	−1.5	1.5

[1] Advance data from the 1988 Annual Survey of Manufactures.

[2] Estimate.

[3] Forecast.

[4] Value of all products and services sold by establishments in the tires and inner tubes industry.

[5] Value of products classified in the tires and inner tubes industry produced by all industries.

SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA). Estimates and forecasts by ITA.

ical decomposition, burning) have not proven to be ecologically acceptable or economically feasible, given current petroleum prices and federal and state restrictions on emissions from burning.

INTERNATIONAL TRADE

Imports of tires and inner tubes have grown steadily since 1985, although this may slow in 1991 as a result of the weak dollar. For the first five months of 1990, imports ran slightly higher than one year earlier. Canada (23.1 percent) and Japan (29.8 percent) accounted for more than more than half of total U.S. imports.

Exports of tire products grew sharply in 1988-1989 and are showing signs of further growth in 1990, thereby leading to further integration of the North American tire markets, as Canada and Mexico continue to absorb the bulk of exports. By mid-year, Canada accounted for nearly half of all exports, followed by Japan (16.4 percent) and Mexico (7.8 percent).

Outlook for 1991

Slowdowns in automobile manufacturing will continue to inhibit demand for automobile OEM (original equipment manufacturer) and replacement tires. Growth in real terms should not exceed 1 to 2 percent. A generally weak dollar will mean lower demand for high-image imported tires and favor the no-name and store brands and increased use for retreads, particularly for trucks tires; exports are likely to remain firm as well. Pricing will remain competitive through 1991.

Long-Term Prospects

Ongoing consolidation of the industry means that the smaller private-label manufacturers will have to cooperate more closely with independent tire dealers and with original equipment manufacturers in order to survive. Competition for the lucrative replacement sales market is likely to intensify as firms formerly associated with high-end market products broaden their sales base. Companies which eventually survive this restructuring will turn to sophisticated marketing in order to differentiate themselves from what consumers consider to be fairly homogeneous and strictly functional products.

Speed of delivery and quality of service are becoming more important to consumers than perceived quality differences for most types of tires. Firms that automate tire record-keeping for the purpose of forecasting tread life and inventory control will be able to enhance service at the level of distribution. A trend toward a dealer-driven store structure will enable manufacturers to market tires more aggressively through independent tire dealers.

RUBBER AND PLASTICS FOOTWEAR

This industry includes manufacturers of fabric upper footwear with rubber or plastic soles vulcanized (baked on), injected molded, or cemented to the uppers, and rubber and plastics protective footwear. Producers of individual shoe parts (rubber, heels, soles, plastic parts, soling strips, and other shoemaking and repair materials) are not covered under this classification. The industry is heavily dependent on compounded rubber mixtures, rubber processing chemicals (accelerators, antioxidants), and fabric.

For the last decade, the industry has undergone a gradual shift from production of shoes with vulcanized or molded soles and fabric uppers to protective footwear for industrial environments. This shift has been accompanied by massive increase in imports of recreational and athletic footwear from low-labor-cost producers at a time of vigorous market demand.

INTERNATIONAL COMPETITIVENESS

Imports of rubber and plastic footwear fell from $1.79 billion in 1987 to $1.58 billion in 1989, but since then have been rising through mid-1990. There has been a reshuffling among the Southeast Asian exporters. China now supplies about a third of the market, followed by South Korea (8.4 percent) and Taiwan (42.9 percent). By mid-1990, China had nearly tripled its share of the U.S. import market at the expense of higher-cost Taiwan and South Korea.

Exports of footwear dropped sharply in 1989 and remained below mid-1989 levels through the middle of 1990. Of the three major U.S. export markets (Canada, Japan, and Mexico), only Canada's share had increased by mid-1990. Intense competition by Taiwan, South Korea, and Malaysia have made it difficult for U.S. producers to gain market share in all but the specialized safety shoe markets.

Outlook for 1991

Growth in real terms is expected to hold around 0.5 percent. Shipments of specialty shoes are expected to remain

Trends and Forecasts: Rubber and Plastics Footwear (SIC 3021)

(in millions of dollars except as noted)

Item	1987	1988[1]	1989[2]	1990[2]	1991[3]	Percent Change 1987-88	1988-89	1989-90	1990-91
Industry Data									
Value of shipments[4]	557	583	617	646	—	4.7	5.8	5.0	—
Value of shipments (1987$)	557	568	574	579	582	2.0	1.1	0.9	0.5
Total employment (000)	10.9	11.7	11.5	11.4	—	7.3	−1.7	−0.9	—
Production workers (000)	9.1	9.9	9.8	8.9	—	8.8	−1.0	−9.2	—
Average hourly earnings ($)	6.23	6.18	—	—	—	−0.8	—	—	—
Capital expenditures	9.4	11.7	—	—	—	24.5	—	—	—
Product Data									
Value of shipments[5]	520	563	604	637	—	8.3	7.3	5.5	—
Value of shipments (1987$)	520	547	564	580	572	5.2	3.1	0.9	0.5

[1] Advance data from the 1988 Annual Survey of Manufactures.

[2] Estimate.

[3] Forecast.

[4] Value of all products and services sold by establishments in the rubber and plastics footwear industry.

[5] Value of products classified in the rubber and plastics footwear industry produced by all industries.

SOURCE: U.S. Department of Commerce: Bureau of the Census, International Trade Administration (ITA). Estimates and forecasts by ITA.

firm, while imports of recreational and athletic footwear from Southeast Asia will continue to subject the U.S. producers to intense pressure. Consumer demand for highly specialized recreational and athletic footwear is likely to soften as consumers switch from high-priced versions to brands with less of a perceived elite image, including counterfeit brands, or restrict their purchases.

Long-Term Prospects

Shifts in favor of low-cost producers will make it more difficult for U.S. producers to compete in the recreational and athletic markets. Perceived differences in quality, however, enable certain imported and domestic brands to continue to pull in image-conscious consumers regardless of price. Copyright infringement by high-volume Asian competitors will continue to cut into U.S. industry sales.

RUBBER AND PLASTICS HOSE AND BELTING

Products in this industry group include rubber and plastics hose and belting and garden hose, for industrial, automotive, and high pressure applications. Plastic and rubber tubing and flexible metallic hose for less demanding uses are not included.

Rubber hose and belting account for a small percentage of total rubber and plastics industry shipments. The bulk of rubber and plastics belting is channelled into transportation sectors (auto/truck), while rubber hose (including hydraulic and garden hose) go into residential and commercial hydraulic uses. Pricing is strongly dependent on the supply of various synthetic rubber resins, compounded rubber mixtures, accelerators, carbon black, and fabric. The last several years have seen a shift toward use of bulk SBR-type (styrobutadiene) resins.

Slowdowns in domestic automobile manufacturing in 1990, and the presence of transplant operations, have resulted in a fiercely competitive market for these products, although analysts believe that U.S. firms have certain cost advantages. New design requirements for hose, brought about by different fuel/hydrocarbon mixtures and advances in power steering technology, have led to some firms carry out significant plant modifications. Bringing U.S. safety standards for some products, including industrial belting, into line with European standards has put manufacturers under additional pressure.

INTERNATIONAL COMPETITIVENESS

Imports have increased consistently since 1985 and were estimated at over $480 million in 1990. The rate of growth has increased since 1990. Major suppliers are Canada (28 percent), West Germany (8 percent), Japan (23 percent), and Mexico (7.6 percent). Exports of hose and belting also have been growing since 1985. Canada and Mexico accounted for over half of U.S. exports in 1990, while the remainder went to a large number of markets with less than 1 percent share.

Outlook for 1991

Growth in hose for residential and commercial use will decline in response to weak housing starts and slowdowns in business construction. Demand for auto hose and belting is expected to lag because of declines in automobile production, although this may be alleviated by growing consumer interest in do-it-yourself repairs. Hose and belting for industrial uses follow the depressed state of the manufacturing sector. The weaker dollar will probably make exports of industrial hose particularly attractive to Mexico, which has recently restructured its industrial sector.

Long-Term Prospects

Growth in auto hose and belting will follow vehicle production closely, while hydraulic rubber hose will tend to track changes in the manufacturing sector as a whole. Garden hose will be strongly dependent on residential housing and commercial building starts. Changes in fuel mixtures will require manufacturers to reformulate material requirements without sacrificing durability. Competitive pressure from transplant operations and imports in the slow-growth market of the early 1990s will make it difficult for the U.S. industry to compete unless cost-cutting measures are continued, including plant closing and layoffs.

FABRICATED RUBBER PRODUCTS

This comprehensive SIC, 3069, includes producers which are primarily engaged in the manufacture of industrial rubber goods; rubberized fabrics; vulcanized rubber clothing; miscellaneous rubber specialties; and druggist and medical sundries excluded from other SIC categories. This

Trends and Forecasts: Rubber and Plastics Hose and Belting (SIC 3052)

(in millions of dollars except as noted)

Item	1987	1988[1]	1989[2]	1990[2]	1991[3]	Percent Change 1987-88	1988-89	1989-90	1990-91
Industry Data									
Value of shipments[4]	2,268	2,416	2,682	2,914	—	6.5	11.0	8.7	—
Value of shipments (1987$)	2,268	2,365	2,436	2,497	2,547	4.3	3.0	2.5	2.0
Total employment (000)	23.2	23.7	23.5	22.1	—	2.2	−0.8	−6.0	—
Production workers (000)	16.6	17.0	16.9	15.4	—	2.4	−0.6	−8.9	—
Average hourly earnings ($)	10.28	10.06	—	—	—	−2.1	—	—	—
Capital expenditures	74.5	146	—	—	—	96.0	—	—	—
Product Data									
Value of shipments[5]	2,214	2,292	2,544	2,758	—	3.5	11.0	8.4	—
Value of shipments (1987$)	2,214	2,244	2,311	2,363	2,416	1.4	3.0	2.3	2.2

[1] Advance data from the 1988 Annual Survey of Manufactures.

[2] Estimate.

[3] Forecast.

[4] Value of all products and services sold by establishments in the rubber & plastics hose & belting industry.

[5] Value of products classified in the rubber & plastics hose & belting industry produced by all industries.

SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA). Estimates and forecasts by ITA.

category includes producers involved in the reclaiming of rubber and articles made from rubber materials. SIC 3069 does not include rubber items covered under other SIC categories (SIC 3052, 3053, 3061). Most products in this group are based on a mixture of bulk styrobutadiene resins, ethylene-propylene, and rubber compounding materials, and processed by various molding, foaming, dipping, and extrusion methods. Raw material costs and factory overhead expenses accounted for well over 60 percent of every sales dollar in 1988-9.

INTERNATIONAL COMPETITIVENESS

After several years of consistent growth, imports dropped sharply in 1989 due to a weaker dollar and declines in the transportation and motor vehicle manufacturing markets. Low labor costs in this labor-intensive business have enabled Southeast Asian producers to capture significant share of the import market. Major suppliers by mid-1990 included West Germany (7.7 percent of imports), Japan (10.6 percent), Malaysia (20.6 percent), South Korea (3.9 percent), Mexico (3.8 percent), Taiwan (11.7) and Thailand (8.6 percent).

Outlook for 1991

The diverse nature of the products makes a meaningful forecast for the entire SIC difficult. Real growth for SIC 3069 is not projected to exceed 2 percent in 1991, although demand for specific product sectors (protective rubber clothing, medical and hospital supplies, and prophylactics) will probably remain firm. Industrial rubber goods will reflect ongoing declines in overall manufacturing. At the same time, latex foam and rubber floor coverings will react to weak auto sales and home furnishings.

Long-Term Prospects

Growth is not projected to exceed 2 to 3 percent a year over the next five years. Low-tech rubber products will continue to be subject to intense competition from Southeast Asian producers. Products made from the more advanced synthetic rubber resins will probably gain ground in hospital and medical uses where durability and impermeability are important. An increasing number of residential furniture and automobile interior fixtures will probably incorporate foam and flexible rubber sponge padding as manufacturers respond to consumer demand for safer and more comfortable products.

MISCELLANEOUS PLASTICS PRODUCTS

Reclassification of the Standard Industrial Classification led to the creation of an entire series devoted to miscellaneous plastics products. SIC 308 presently covers the following product lines: SIC 3081 for unsupported plastics film and sheet, from resins produced in the same plant; SIC 3082 for unsupported plastics profiles, rods, tubes and other shapes; SIC 3083 for laminated plastics plate, sheet, profiles, rods and tubes; SIC 3084 for all kinds of plastics pipe; SIC 3085 for plastics bottles (not included in this chapter); SIC 3086 for plastics foam products; SIC 3087 for custom compounding of purchased plastic resins; SIC 3088 for plastics plumbing fixtures; and SIC 3089 for plastic products not included in any of the previous categories.

Most products under SIC 308 are manufactured by the following sequence: the basic raw materials (monomers) are chemically transformed into more complex substances (polymers). These polymers are then mixed with additives which impart specific properties (durability, flexibility, color). Then the mixture can be further processed by what are known as processors and compounders (coaters, film and sheet processors, molders, laminators, and extruders), each of which is capable of producing a wide variety of products (film, sheet, and rigid materials) by various processing technologies (injection molding, blow molding, thermoforming, transfer molding, reaction injection molding, compression molding, and extrusion). This output can then be channelled to exports and to the following sectors: transportation; packaging; building and construction; electrical and electronic; furniture and furnishings; consumer and institutional; and industrial and machinery.

Outlook for 1991

Real growth in 1991 is expected to reflect declines in consumption by the housing/construction and transportation markets, but disposable items are expected to hold firm. Overall industry shipments will probably grow by no more than 3 percent.

Long-Term Prospects

Custom processors will turn to newer synthetic rubber and plastic resins and incorporate them into an ever-expanding

Trends and Forecasts: Fabricated Rubber Products, NEC (SIC 3069)

(in millions of dollars except as noted)

						Percent Change			
Item	1987	1988[1]	1989[2]	1990[2]	1991[3]	1987-88	1988-89	1989-90	1990-91
Industry Data									
Value of shipments[4]	5,254	6,200	6,741	7,152	—	18.0	8.7	6.1	—
Value of shipments (1987$)	5,254	6,012	6,312	6,502	6,632	14.4	5.0	3.0	2.0
Total employment (000)	54.0	57.7	55.6	53.0	—	6.9	−3.6	−4.7	—
Production workers (000)	40.4	43.6	41.9	39.3	—	7.9	−3.9	−6.2	—
Average hourly earnings ($)	8.69	9.21	—	—	—	6.0	—	—	—
Capital expenditures	140	163	—	—	—	16.4	—	—	—
Product Data									
Value of shipments[5]	5,226	5,963	6,485	6,879	—	14.1	8.8	6.1	—
Value of shipments (1987$)	5,226	5,783	6,072	6,254	6,380	10.7	5.0	3.0	2.0

[1] Advance data from the 1988 Annual Survey of Manufactures.

[2] Estimate.

[3] Forecast.

[4] Value of all products and services sold by establishments in the fabricated rubber products, nec industry.

[5] Value of products classified in the fabricated rubber products, nec industry produced by all industries.

SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA). Estimates and forecasts by ITA.

Trends and Forecasts: Miscellaneous Plastics Products (SIC 308, excluding SIC 3085 and 3088)

(in millions of dollars except as noted)

Item	1987	1988[1]	1989[2]	1990[2]	1991[3]	Percent Change 1987-88	1988-89	1989-90	1990-91
Industry Data									
Value of shipments[4]	58,210	62,912	—	—	—	8.1	—	—	—
Value of shipments (1987$)	58,210	58,590	58,649	58,942	59,237	0.7	0.1	0.5	0.5
Total employment (000)	566.7	583.2	583.1	575.9	—	2.9	0.0	−1.2	—
Production workers (000)	439.5	451.0	448.9	440.8	—	2.6	−0.5	−1.8	—
Average hourly earnings ($)	8.43	8.54	8.60	8.65	—	1.3	0.7	0.6	—
Capital expenditures	2,431	3,315	—	—	—	36.4	—	—	—
Product Data									
Value of shipments[5]	57,933	61,807	—	—	—	6.7	—	—	—
Value of shipments (1987$)	57,933	57,548	57,600	57,888	58,178	−0.7	0.1	0.5	0.5

[1] Advance data from the 1988 Annual Survey of Manufactures.

[2] Estimate.

[3] Forecast.

[4] Value of all products and services sold by establishments in the miscellaneous plastics products industry.

[5] Value of products classified in the miscellaneous plastics products, nec industry produced by all industries.

SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA). Estimates and forecasts by ITA.

variety of niche product markets. Concern over recycling and disposal will drive firms to incorporate disposal into design of new operations, while in some cases older materials such as paper and glass may gain popularity among environmentally conscious consumers. The smaller, privately-owned processors will find themselves locked into state and municipal waste disposal schemes, while better-financed diversified plastic companies will have an incentive to shift to less regulated environments domestically or overseas. Consumer-oriented firms will attempt to gain market share by touting their efforts to provide consumers with safer products, while suppliers to the transportation, electrical/electronic, and institutional markets will not be significantly affected.—*Raimundo Prat, Office of Chemicals and Allied Products, (202) 377-0128, September 1990.*

Additional References

(Call the Bureau of the Census at 301-763-4100 for information about how to order Census documents.)

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Rubber Statistical Bulletin, International Rubber Study Group, 8th Fl. York House, Empire Way, Wembley HA90PA, UK, London, England. Telephone: (081) 903-7727.

Elastomerics, Communication Channels, 6255 Barfield Road, Atlanta, GA 30328. Telephone: (404) 256-9800.

Rubber and Plastics News, Crain Communications, 1725 Merriman Road, Suite 300, Akron, OH 44313. Telephone: (216) 836-9180.

Facts and Figures of the U.S.Plastics Industry, Society of the Plastics Industry, 1275 K Street, NW, Suite 400, Washington, DC 20005. Telephone: (202) 371-5202.

Rubber Manufacturers Association, 1400 K Street, NW, Washington, DC 20005. Telephone: (202) 682-4800.

International Institute of Synthetic Rubber Producers, 2077 S. Gessner Street, Suite 133, Houston, TX 77063. Telephone: (713) 783-7511.

15

Metals

The steel industry (SIC 3312, 3315, 3316, 3317) showed surprising strength through 1990, with an estimated decline of less than 2 percent in constant dollars, despite a slowdown in the growth of the U.S. economy. Near-record global consumption of steel discouraged imports and boosted exports. In 1991 domestic steel shipments are expected to decline approximately 5 percent. The slow growth in the economy and expected sharp drops in two key markets for steel, nonresidential construction, and consumer durables, will be major factors contributing to the downturn.

Foundry shipments decreased by approximately 8.8 percent in 1990, due primarily to declines in the automotive and heavy machinery sectors. Casting shipments in 1991 are expected to fall short of the 1990 level by approximately 1.4 percent.

The nonferrous metals industries covered in this chapter—aluminum, copper, lead, nickel, titanium, and zinc—for the most part experienced an increase in production and a slight or moderate decrease in demand in 1990. Prices were mixed in 1990, with aluminum, lead, and titanium up, while nickel, copper, and zinc were down. Increases in production in 1991, together with an easing of demand for most metals and a general economic slowdown, will result in price declines for most metals in 1991.

Before reading this chapter, please see "How to Get the Most Out of This Book" on page 1. It will clarify questions you may have concerning data collection procedures, factors affecting trade data, forecasting methodology, the use of constant dollars, the difference between industry and product data, sources and references, and the Standard Industrial Classification system (SIC). For other topics related to the subject of this chapter, see chapters 1 (Metals and Industrial Minerals Mining); 3 (Crude Petroleum and Natural Gas); 5 (Construction); 7 (Construction Materials); 8 (Electric Lighting and Wiring Equipment); 10 (Paper and Allied Products); 11 (Cans and Containers); 12 (Chemicals and Allied Products); 13 (Industrial and Agricultural Chemicals); 14 (Plastics and Rubber); 17 (Electronic Components and Super-conductors); 20 (Industrial Machinery); 22 (Aerospace); 36 (Cleaning Preparations and Cosmetics); 37 (Motor Vehicles); 39 (Personal Consumer Durables); and 41 (Transportation Services).

STEEL-MILL PRODUCTS

The steel industry (SIC 3312, 3315, 3316, 3317) showed surprising resilience through 1990 despite a slowdown in the growth of the U.S. economy. Aided by near record global consumption of steel, which effectively discouraged imports while boosting exports, domestic shipments (measured in tons) at midyear were less than 2 percent below the 1989 level that was the highest level since 1981. Demand from capital goods industries, benefiting from a surge in exports of steel-containing products, remained strong, and increased oil drilling prompted a resurgence of the long-depressed pipe and tube market. Even the weak motor vehicle sector, which had sustained a 14 percent drop in shipments at midyear, benefited from some pickup in demand during the summer. Moreover, in spite of the uncertainty generated by the Persian Gulf crisis, orders in August remained firm for the balance of the year. The capacity utilization rate, which would normally be expected to fall due to seasonal factors, was at 86 percent in August, the highest level of the year. The one uncertainty was the outlook for consumer durable markets in view of an apparent erosion of consumer confidence. Consumer products account for approximately one-third of steel demand.

Despite high demand and operating rates, steel prices were below 1989 levels, having begun to slide in April 1989,

Table 1: Steel Mill Products Trends and Projections

(SIC 3312, 3315, 3316, 3317)

(in millions of tons except as noted)

Item	1980	1986	1987	1988	1989	1990[1]	1991[2]	Compound annual rate of growth 1980–90	Percent change 1990–91
Raw Steel Production	111.8	61.6	89.1	99.9	97.9	96.5	92.0	−1.5	−4.7
Continuous casting (percent)	20.3	55.2	59.8	61.3	64.8	67.0	69.0	12.7	3.0
Steel mill product shipments	83.8	70.3	76.7	83.8	84.1	84.0	80.0	0.0	−4.8
Exports	4.1	0.9	1.1	2.1	4.6	4.1	3.5	0.0	−14.6
Imports	15.5	20.7	20.4	20.9	17.3	16.8	16.9	0.8	0.6
Apparent domestic consumption	95.2	90.0	95.9	102.7	96.9	96.7	93.4	0.2	−3.4
Exports as a % of shipments	4.9	1.3	1.4	2.5	5.5	4.9	4.4	0.0	−10.4
Imports as a percent of apparent consumption	16.3	23.0	21.3	20.4	17.9	17.9	18.1	0.6	4.1

[1] Estimate.

[2] Forecast.

SOURCE: U.S. Department of Commerce: Bureau of the Census, International Trade Administration; industry sources.

and recovering only partially by the summer of 1990. The weak prices, coupled with higher costs for labor and some raw materials, and expenses associated with temporary closings and startups at plants, depressed industry profits during the first half of the year. Operating income through June fell by more than half to $314 million from the previous year.

Globally, demand was expected to be essentially stable in 1990. Apparent consumption of steel mill products globally was forecast to decline approximately 1 percent from its 1989 peak, to 700 million net tons, according to the Organization for Economic Cooperation and Development (OECD). The market is especially strong in Japan, where demand is being propelled by sharply rising capital expenditures for fixed investment and construction.

INTERNATIONAL DEVELOPMENTS

Imports of carbon and alloy steel mill products have been subject to restraint since October 1984, when President Reagan's steel program went into effect. The program, which was instituted to address the problem of dumped and subsidized steel imports, was expected to provide opportunities for restructuring and modernizing the domestic industry by limiting imports to 20.5 percent of the market for a five-year period. A key component of the program was the negotiation of 21 bilateral voluntary restraint agreements (VRAs) covering imports from 29 countries. The program was strongly supported by the steel industry, which mounted an aggressive campaign for a five-year extension before the program's scheduled expiration in September 1989.

In July 1989, President Bush announced his Steel Trade Liberalization Program, which had two principal components: extension of the VRAs beyond September 1989, and simultaneous negotiation of an international consensus to eliminate those trade-distorting practices that precipitated the original program. Bilateral agreements were subsequently concluded with 16 countries and the European Community (EC) that place an import ceiling of 19.1 percent of U.S. apparent consumption from these countries for the first period of the two-and-a-half-year extension, with additional increases authorized in subsequent periods for countries supporting the international consensus.

The first step toward the international consensus was the negotiation by December 1989 of bilateral consensus agreements (BCAs) with nine VRA countries and the EC. The BCAs, most of which will terminate on the same day as the VRAs, prohibit future subsidies and commit each signatory to open its markets by eliminating nontariff measures and reducing or eliminating tariffs in the Uruguay Round of multilateral trade negotiations. The agreements also incorporate an effective dispute resolution mechanism and a commitment to work with the United States to incorporate the disciplines of the BCAs into a multilateral agreement.

During the summer of 1990, the United States outlined its objectives for a multilateral steel agreement to its major trading partners. A number of these countries, including the EC, Japan, and Sweden, voiced support for pursuing the multilateral consensus that would provide a long-term solution to the practices that have distorted steel trade for many years.

In the United States, the perennially large trade deficit in steel mill products narrowed sharply during the first half of 1990, reflecting sustained demand for steel globally and the relative weakness of U.S. steel prices, which encouraged exporters to seek other markets. During the first six months of the year, net imports totaled 5.8 million tons, down from 6.5 million in 1989 due to a steep (9 percent) drop in imports; this improvement was partially offset by a small decline in exports. The peak annual trade deficit for this period was 12.5 million tons in 1985.

U.S. Exports and Imports
Steel Mill Products
(in millions of dollars except as noted)

SIC	Industry	1989	1990[1]	1991[2]	Percent Change 1989-90	Percent Change 1990-91
331A	Steel Mill Products					
	Value of exports	2,954	2,425	—	−17.9	—
	Value of imports	9,601	8,760	—	−8.8	—

[1] Estimate.

[2] Forecast.

SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA). Estimates and forecasts by ITA.

The drop in exports reversed the upward trend that began in 1987 and peaked in 1989. The falloff resulted from increased international price competition, fluctuations in exchange rates (notably the Japanese yen) and, at mid-year, a pickup in domestic orders, which pinched supply. Exports to China and the Soviet Union, which had become important markets in 1989, were down sharply due to the economic difficulties there. However, shipments to Canada and Mexico, historically the two largest markets for American steel, rose 61 percent, to 45 percent of total exports through June. And despite the export decline during the first half of 1990, the actual level—2.1 million tons—was above the annual average for the 1980s.

The sharp decline in the volume of imports during the first half of 1990 reduced import penetration to 16.2 percent of apparent consumption, the lowest level for this period since 1981. Through May, countries subject to voluntary restraint agreements (VRAs) collectively undershipped their import

U.S. Trade Patterns in 1989
Steel Mill Products
SIC 3312, 3315, 3316, 3317
(in millions of dollars, percent)

Exports			Imports		
	Value	Share		Value	Share
Canada & Mexico	984	33.3	Canada & Mexico	1,890	19.7
South America	126	4.3	South America	675	7.0
European Community	164	5.6	European Community	2,066	21.5
East Asia NICs	732	24.8	East Asia NICs	733	7.6
Japan	239	8.1	Japan	2,434	25.4
Other	709	24.0	Other	1,803	18.8
World Total	2,954	100.0	World Total	9,601	100.0
Top Five Countries					
	Value	Share		Value	Share
Canada	562	19.0	Japan	2,434	25.4
Mexico	422	14.3	Canada	1,651	17.2
South Korea	300	10.2	West Germany	879	9.2
Japan	239	8.1	France	644	6.7
China	238	8.1	South Korea	529	5.5

See "How to Get the Most Out of This Book" for definitions of the Country Groupings.

SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA).

ceilings by 37 percent. With low prices here and continued decline of the dollar, it seemed unlikely that imports would rise significantly during the second half of the year.

Restructuring

Pressured by increased domestic and international competition in a shrinking market, declining profits, and the development of new technologies, the domestic steel industry restructured during the 1980s by closing more than 25 percent of its raw steelmaking capacity, modernizing its plants, and cutting its labor force in half. Other trends of the late 1980s were the movement of low-cost minimills into new markets and the accelerated internationalization of the steel industry through joint ventures and projects with foreign producers.

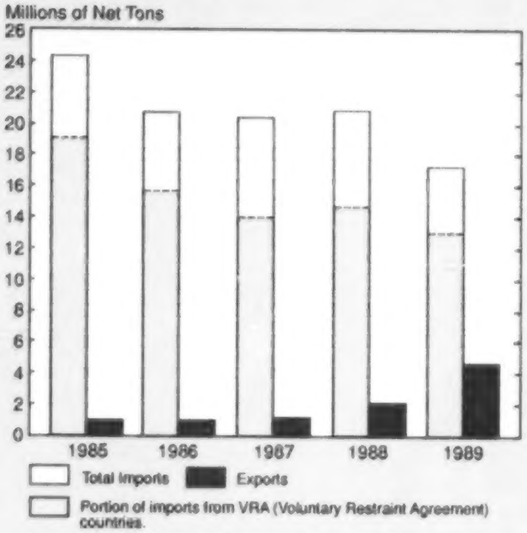
To enhance their competitiveness, many steelmakers, especially in the integrated sector, are becoming increasingly specialized. Because of intense competition from minimills, they have largely stopped making long products, i,.e, wire rod, bar, and light structural shapes, to focus on the high volume and high value-added flat-rolled market. Substantial resources are being devoted to improving the quality of their products, noticeably through modernization of hot-strip mills and increased use of continuous casting and computer controls. Integrated processing and minimill operations are different ways of producing raw steel.

Downstream, the major producers are adding new capacity in galvanizing lines at the high-value end of the sheet market. By 1992, an additional 3.5 million tons of galvanizing capacity (a 30 percent increase over the current level) will be on line, representing an investment of more than $1.2 billion. These coated products are in high demand from the automotive and appliance markets because of their corrosion resistance. However, there is some concern that, at least initially, this growing market will be unable to accommodate the new mills coming on line. Since 1985, the galvanized sheet market (as measured by apparent consumption) has grown more than 19 percent to nearly 12 million tons.

In a challenge to the integrated sector's total dominance of the flat-rolled sector, a minimill began producing commodity grade flat-rolled steel in commercial quantities in late 1989. The mill, which has a capacity of 800,000 tons—quite small by integrated mill standards—and comparatively low capital costs, encountered significant start-up difficulties owing to its use of breakthrough technologies. Nevertheless, the mill was operating at 75 percent of its annual capacity in August. So successful was the project that Nucor Corporation, the mill's owner, was expected to announce plans before the end of the year to build a second plant with a 1-million ton capacity, and several other minimills indicated that they, too, planned to enter this market. While the entry of Nucor and other minimills will pressure integrated producers, their impact will be lessened both by the size of market and the commodity grade of their product. The high value-added flat-rolled market that is the focus of intensive marketing efforts of the big producers remains beyond minimill capability.

Figure 15-1

Trade in Steel Mill Products, 1985-89



Source: U.S. Department of Commerce, Bureau of the Census and International Trade Administration.

Increasingly, the U.S. steel industry is coming under foreign ownership, a trend that accelerated in 1990 with the purchase by a Japanese steelmaker of a majority interest in National Steel, this nation's fourth largest producer. Previously, most

Trends and Forecasts: Steel Mill Products (SIC 3312, 3315, 3316, 3317)

(in millions of dollars except as noted)

						Percent Change			
Item	1987	1988[1]	1989[2]	1990[2]	1991[3]	1987–88	1988–89	1989–90	1990–91
Industry Data									
Value of shipments[4]	51,066	63,598	—	—	—	24.5	—	—	—
Value of shipments (1987$)	51,066	59,010	59,200	58,608	55,800	15.6	0.3	−1.0	−4.8
Total employment (000)	250	263	263	255	247	5.2	0.0	−3.0	−3.1
Production workers (000)	193	203	202	195	189	5.2	−0.5	−3.5	−3.1
Capital expenditures	1,643	2,230	—	—	—	35.7	—	—	—
Product Data									
Value of shipments[5]	50,162	61,631	—	—	—	22.9	—	—	—
Value of shipments (1987$)	50,162	57,021	57,187	56,850	54,100	13.7	0.3	−0.6	−4.8

[1] Advance data from the 1988 Annual Survey of Manufactures.

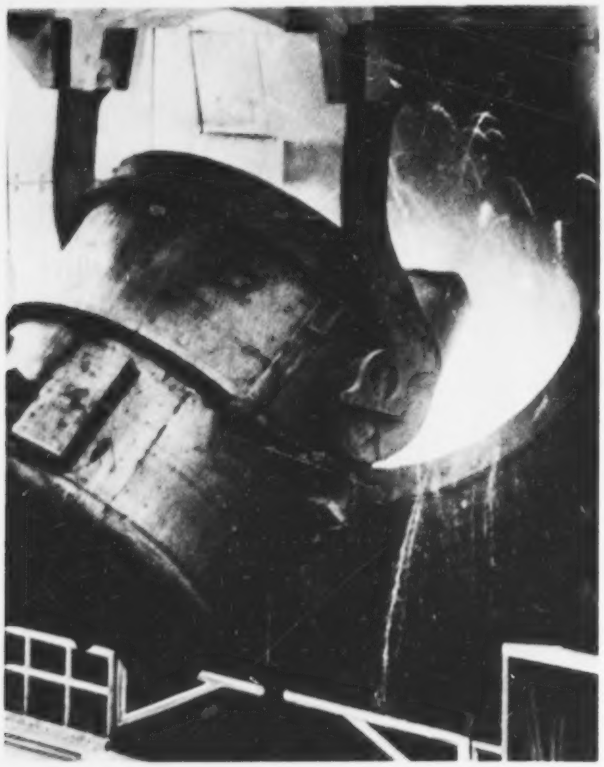
[2] Estimate.

[3] Forecast.

[4] Value of all products and services sold by establishments in the steel mill products industry.

[5] Value of products classified in the steel mill products industry produced by all industries.

SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA). Estimates and forecasts by ITA.


USX

Molten iron is charged into a basic oxygen process (BOP) furnace at a steel plant near Pittsburgh, PA. To enhance competitiveness, many steelmakers are becoming increasingly specialized.

foreign investment has taken the form of 50–50 joint ventures between integrated U.S. and Japanese steelmakers. A 1990 Commerce Department study examining Japanese investment as measured by employment in Japan's U.S. affiliates identified 17 plants with a total employment of 33,000, the highest of any 4-digit SIC category. The U.S. producers were motivated to establish joint ventures in order to gain access to Japanese capital and state-of-the-art technology that would enable them to manufacture higher value-added products. As reasons for engaging in joint ventures, Japan's steelmakers cite access to the growing number of Japanese motor vehicle assembly plants here, the improved competitiveness of steelmaking in the United States, lower home country capital costs, and the weak dollar. The result is that U.S. steelmakers are now able to produce superior products at a lower cost than would otherwise be possible.

In the automobile sector, for example, advances in technology have enhanced steel's competitiveness against substitutes, one of the factors cited for the recent cancellation of a number of plans by the automakers to replace steel auto parts with plastics. These advances include ultra low carbon steels that are more formable and dent-resistant than higher carbon steels, lighter weight steels, and coated steels with greater corrosion resistance.

Steel's comparatively low cost has allowed the industry to recapture some of the beverage can market that had been largely lost to aluminum in the mid-1970s. To boost steel's appeal, the industry established a steel can recycling program that has been able to increase the recycling rate for steel cans to 21 percent in 1989, from 15 percent in 1986. As part of the program, steelmakers are committed to purchase can scrap for their furnaces.

Labor Issues

Since 1982, the American steel industry has moved aggressively to boost its international competitiveness by reducing unit labor costs, which have historically been its single largest production cost. Measures have included increasing productivity, introducing new technologies, obtaining labor contract concessions, and shutting down the most labor-intensive mills. By one independent estimate, labor costs for each ton shipped have been cut nearly 40 percent during this period.

The successful efforts to raise productivity have had an enormous impact on steel industry employment and competitiveness. Largely because of productivity gains, the industry will ship the same amount of steel in 1990 as in 1980 with only half the work force. Moreover, the industry moved from being one of the less efficient producers in the developed world to become, briefly in the late 1980s, the most efficient. However, the U.S. advantage is eroding as recent productivity gains elsewhere exceed those here. In fact, according to U.S. Bureau of Labor Statistics (BLS), the sharp productivity growth since 1982 was partially reversed in 1989 as the decline in output exceeded the drop in employee-hours.

Another factor contributing to higher unit-labor costs is the rise in total workers' compensation resulting from the 1989 contract settlements at four of the large integrated steelmakers. During the first half of the year, total hourly compensation costs rose more than 4 percent in current dollars, to $25.95 an hour. The contracts, which extend through July 1993, are likely to raise hourly employment costs 3 to 5 percent annually, or to $30 at the end of the contract. The labor agreement at the largest domestic producer, USX Corporation, will expire in February 1991. That company, which endured a lengthy work stoppage pending renegotiation of its labor contract in 1986, termed the pattern of settlements in 1989 very costly and rejected the Steelworkers' request for reopening their current contract to bring compensation to the levels of other companies.

Environmental Developments

The 1990 amendments to the Clean Air Act impose tougher standards governing the emission of hazardous pollutants. In recognition of the special difficulties faced by the steel industry in reducing toxic emissions from coke ovens, Congress gave the industry until 2020 to comply with a strict risk standard for cancer-causing emissions. The extension is conditioned on the steel industry's installation of the best technology available to progressively reduce hazardous emissions from coke ovens under a set timetable before 2020.

Environmentalists argue that the steel industry will be able to meet emission standards and avoid shutdowns through the development of direct or one-step steelmaking technology, which would eliminate the need for coke in steel manufacturing. Under a $30-million joint program carried out by the American Iron and Steel Institute and the U.S. Department of Energy, direct steelmaking processes are being studied with the aim of permitting the continuous production of steel in a single reactor system using prereduced iron ore pellets and unrefined coal. Direct steelmaking would thus supersede the coke ovens and iron furnaces that are presently required to convert iron ore to steel.

The steel industry cautions, however, that there is no assurance direct steelmaking technology can be commercially developed within the time limits mandated by the Clean Air Act amendments. For more information on the steel industry, see the 1990 U.S. Industrial Outlook, chapter 16, "Ferrous Metals."

Outlook for 1991

Steel shipments are expected to decline by more than 4 percent in 1991 to 80 million tons. While this level would be a break from the 84-million ton plateau shipped during the last three years, it would be a considerable improvement over the depressed volume of the mid-1980s. The slow growth in the economy and expected sharp drops in two key markets for steel—nonresidential construction and consumer durables—will be major factors contributing to the downturn. Capital goods sectors are not expected to provide more than a nominal increase in demand. Inventory swings are not likely to be a factor.

Long-Term Prospects

Barring a recession, demand for steel mill products is likely to be relatively stable over the the next 5 years. The long-term decline in the steel intensity of the economy that has contributed so much to the erosion in steel consumption appears to be lessening. Steel may be better able to maintain—or in some cases increase—its share of some markets.

The problem of steelmaking overcapacity that so plagued the industry during the mid-1980s does not seem likely to be repeated in the next decade. Most developed countries substantially downsized their steel industries and will likely continue reducing capacity. In developing countries, increases in capacity are more likely to be kept in balance with demand. As a result, operating rates are expected to remain much higher than during the mid-1980s, when global surplus capacity contributed to high import levels and inflated the domestic industry's cost structure.—*Charles Bell, Office of Basic Industries, (202) 377-0606, October 1990.*

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FOUNDRY INDUSTRY

Shipments of foundry products (SIC 3321, 3322, 3323, 3324, 3325, 3363, 3364, 3365, 3366, 3367, 3368, 3369) fell by approximately 8.8 percent in 1990. Decreased production in the automotive sector and heavy machinery sectors was the primary reason for the drop. Most ferrous foundries were operating at approximately 65 to 70 percent of capacity; nonferrous foundries were operating in the range of 50 to 75 percent, with aluminum and zinc foundries at the higher end, and copper, brass, and bronze foundries at the lower end.

Total demand for castings is determined by demand in the end-use sectors, especially in the automotive and machinery manufacturing industries in the case of iron, aluminum, magnesium, and zinc; railroad equipment in the case of steel; plumbing fixtures, valves, and fittings in the case of copper; and ballasts and battery plates in the case of lead. Die castings account for about 60 percent of all nonferrous castings shipments. Aluminum castings have constituted about three-fourths of total die castings, with zinc accounting for most of the rest. Foundries generally have weak market position and must remain highly competitive in pricing their product because of excess capacity and because both their suppliers and customers tend to be larger enterprises than the foundries themselves (see Tables 2, 3, and 4 for ratios of metals comprising casting shipments, casting shipments by end-use markets, and shipments of cast metals as a percentage of total weight).

The foundry industry has suffered from a shortage of skilled workers and foundry engineers in recent years. Limited funding for foundry education, and reluctance on the part of workers to enter a heavy industry sector subject to wide cyclical swings, a high ratio of retirements to entries of new workers into the field, and competition with employment in the service sector are the primary reasons for the foundry labor shortage. Foundry employment in 1991 is predicted to decrease by approximately 5 percent. However, foundry sala-

Table 2: Casting Shipments

(SIC 332, 336)
(000 mt)

Item	1987	1988	1989	1990[1]	1991[2]	Percent Change 1988-89	Percent Change 1989-90	Percent Change 1990-91
Ductile iron	2,648	2,884	2,554	2,357	2,416	−11.4	−7.7	2.5
Gray iron	5,159	4,838	4,241	3,770	3,642	−12.3	−11.1	−3.4
Malleable iron	288	330	257	227	209	−22.1	−11.7	−7.9
Steel	753	919	1,031	980	885	12.2	−4.9	−9.7
Copper	218	227	218	204	191	−4.0	−6.4	−6.4
Aluminum	1,007	1,051	998	945	1,007	−5.0	−5.3	6.6
Zinc	223	221	214	192	201	−3.2	−10.3	4.7
Magnesium	10	11	10	9	9	−9.1	−10.0	0.0
Lead	22	24	21	18	16	−12.5	−14.3	−11.1
TOTAL	10,328	10,505	9,544	8,702	8,576	−9.1	−8.8	−1.4

[1] Estimate
[2] Forecast

SOURCE: U.S. Department of Commerce: Bureau of the Census, International Trade Administration (ITA), and industry sources.

Table 3: Casting Shipments by End-Use Market

	Percent of Total Market by Weight
Machinery and Equipment	36.9
Cars and Trucks	33.1
Pressure Pipe and Fittings	11.4
Railroad	5.2
Ingot Molds	4.8
Valves and Fittings	4.0
Pumps and Compressors	2.2
Other	2.4
Total	100.0

Source: U.S. Department of Commerce, International Trade Administration; American Cast Metals Association.

ries should increase moderately reflecting, workers' higher skill level and the pressure to retain trained workers.

Like other heavy industries, foundries generate, and must manage, sizable waste streams. Foundries have made steady progress in waste reduction, waste reclamation, and recycling. During the year, the industry initiated a major study of foundry solid-waste management practices. Nevertheless, costs of compliance continue to squeeze profits, in an already highly price-competitive market. Some foundry companies have dealt with rising environmental costs by relocating operations in states with less stringent environmental regulations.

INTERNATIONAL COMPETITIVENESS

It is difficult to determine the true volume of foreign trade in this industry because most castings are imported or exported as components of finished products. However, overall reductions in the trade deficit for capital goods, autos, and auto parts suggests improvement in the U.S. balance of trade in castings, which should continue into 1991. In many instances, casting consumers have returned to domestic suppliers. Automotive industry sources report that Japanese manufacturers of motor vehicles with plants in the United States are gradually increasing purchases from domestic suppliers, in some cases from acquired operations. During 1990 foundries continued to be targeted for acquisition by foreign and U.S. investors seeking metal casting capabilities to add to their existing manufacturing operations.

The decline in the value of the dollar from the mid-1980s and the need of castings consumers for shorter lead times and just-in-time delivery are important factors in improving the trade picture for this industry. Consumers' dissatisfaction with foreign foundries' quality and service, as well as foreign acquisition of domestic foundries, have also supported domestic production. Foundries are continuing to expand their capabilities to increase the value per pound of product to the consumers, thereby increasing their international competitiveness. The trade recovery, however, will continue to be uneven throughout the industry. Import penetration will remain a serious issue among producers of standardized, highly price-sensitive products such as municipal castings and many simple valves and fittings.

Table 4: Shipments of Cast Metals, as a Percentage of Total Market, by weight

Item	1979	1985	1989
Ductile iron	14.3	22.3	26.8
Gray iron	62.8	52.3	44.4
Malleable iron	3.8	3.2	2.7
Steel	10.8	8.1	10.8
Copper	1.6	2.0	2.3
Aluminum	5.3	9.6	10.5
Zinc	1.4	2.2	2.2
Magnesium	0.1	0.1	0.1
Lead	0.1	0.2	0.2
Total	100.0	100.0	100.0

Note: Detail may not add up to total due to rounding.

Source: U.S. Department of Commerce: Bureau of the Census; International Trade Administration.

Outlook for 1991

Total casting shipments will probably fall short of 1990 levels by approximately 1.4 percent. Shipments of ductile iron, aluminum, and zinc castings may increase due to the moderate improvement anticipated in the automotive and industrial machinery sectors, but castings of other metals will probably fall. The industry should retain most of the business it recaptured from foreign competitors in the late 1980s.

Improving workers' skill levels and obtaining the necessary capital to upgrade operations and keep pace with technological advances will continue to be key issues to the foundry industry. Foundry sand disposal and emissions control will also be major concerns during 1991.

Long-Term Prospects

Long-term prospects for the foundry industry will depend on a number of factors. From a technological standpoint, near net shape casting technology will stimulate sales by enabling the design and production of thinner-walled, lighter weight, more intricate castings. Lighter-weight castings reduce shipping costs and have superior weight-to-strength ratios. Offering stronger, lighter-weight, higher value products may also enhance the industry's future exports.

When machining is required, CAD/CAM (computer-aided design/computer-aided manufacturing) systems, already in use in many foundries, will find increased application. Precise machining adds further value to the castings, resulting in significant increase in the value per ton of castings shipped. While gross tons shipped may decline, value per ton will increase over the long term. Automation in foundry process technology, especially coremaking and general materials handling, will continue to reduce foundry labor intensity and therefore costs.

From a financial and operational standpoint, the long-term health of large segments of the foundry industry will depend as much upon the industry's ability to increase productivity and offer greater added value per pound of product, as it will upon the traditional forces of end-use sector demand, the general level of economic activity, competition from substitute materials and the strength of the U.S. dollar. Since increasing productivity often requires costly research and development, new production equipment, and worker training, access to capital, often a problem for highly fragmented industries, will be a key determinant of future success. Consequently, more cooperative research and development, joint venture projects, and further industry restructuring in the form of mergers and acquisitions are likely to occur.—*Brian Duggan, Office of Metals, Minerals and Commodities, (202) 377-0575, September, 1990.*

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ALUMINUM

U.S. shipments of aluminum ingot and mill products in 1990 decreased 6.5 percent from 1989 levels to 6.8 million metric tons (15.0 billion pounds). The slump in domestic shipments was even greater, but exports, especially of ingot, and to Japan in particular, helped to bolster overall shipments (see Table 5). The demand for aluminum worldwide in 1990 was approximately equal to that in 1989, but varied significantly among the major consuming regions of the United States, Japan, and Europe. Demand was weakest in the United States and strongest in Japan. Shipments by aluminum distributors decreased for the second year in a row, falling to 700,000 metric tons.

Domestically, shipments to all the major end-use sectors except containers and packaging declined. Containers and packaging, principally aluminum beverage cans, accounted for approximately one-third of aluminum shipments (see Chapter 11). Shipments to the second largest end-use sector, transportation equipment, declined due to sagging U.S. auto production. Within this sector, shipments to the commercial aerospace industry were buoyant, but this market represented only 15 percent of transportation equipment demand. Shipments to the third largest end-use sector, construction, also declined, and continued to lose market share to vinyl in siding and window frames. Together, these sectors represent approximately two-thirds of U.S. aluminum shipments.

Primary aluminum production in the United States, and worldwide, continued to remain at near capacity levels. Despite high-capacity utilization there was an approximate supply/ demand balance without any significant changes in the levels of inventories held by producers and fabricators. U.S. production slightly exceeded 4 million metric tons. Production levels remained fairly constant throughout the year. The closure of one potline at the Ravenswood, WV smelter in anticipation of a labor strike, was offset by the reactivation of the potline at Alcoa's Wenatchee, VA facility. The potline at Ravenwswood is the only idle smelter capacity in the United States, since Ormet restarted its Hannibal, OH potline during the year.

Aluminum prices reached a low in 1990 in the 60 cents-per-pound range, close to the marginal cost of production, and spent most of the year in the 70 cents-per-pound range. However, prices increased significantly in the latter part of the year, due mostly to concern over aluminum supplies from the Persian Gulf as a result of the Iraqi invasion of Kuwait.

Table 5: Supply and Shipments of Aluminum Ingot and Mill Products

(thousand metric tons)

Item	1987	1988	1989	1990[1]	1991[1]	1995[1]
Total Shipments	7,394	7,439	7,271	6,800	6,800	7,650
Primary Ingot Production	3,347	3,945	4,030	4,020	4,000	4,000
Exports	570	786	1,092	1,245	1,265	1,160
Ingot	281	400	595	750	750	400
Mill Products	289	386	497	495	515	560
Imports	1,701	1,467	1,353	1,375	1,350	1,825
Ingot	1,246	1,027	926	925	925	1,350
Mill Products	455	440	427	450	425	475

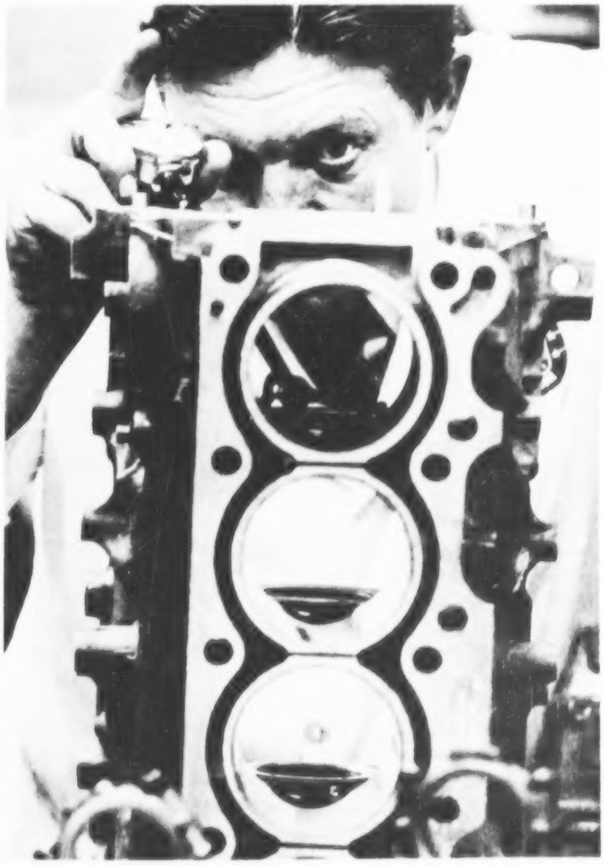
[1] Estimates.

Source: The Aluminum Association; U.S. Department of Commerce, International Trade Administration (ITA).

Environmental Issues

The primary aluminum industry faces intense competition in both the international and domestic markets. Yet, despite some of the highest power costs in the world, the U.S. industry, aided by depreciation in the value of the dollar, has reduced production costs and undergone a major restructuring to emerge as a competitive producer of primary aluminum.

U.S. aluminum producers pay more for electricity than producers in other market-economy nations. This substantial cost disadvantage was the primary reason for the 24 percent contraction in U.S. smelting capacity from 1982 to 1987. Power rates charged by utilities often vary with the price of aluminum to ensure that smelters are able to sustain operations when aluminum prices are low. Meanwhile, smelter capacity is expanding in countries with relatively inexpensive means of producing electricity, such as hydropower in Canada, Venezuela, and Brazil, and cheap natural gas in the Middle East. However, plans for expansion in the area of the Persian Gulf (projects in Qatar, Saudi



Reynolds Metals Company

Energy-saving transportation uses, like this all-aluminum engine block, make aluminum important today in modern engineering and design. U.S. aluminum shipments are expected to increase at a compound rate of approximately 3 percent through 1995.

Arabia, Iraq, Iran, and the United Arab Emirates) are in doubt due to Iraq's invasion of Kuwait.

The electricity costs paid by the U.S. aluminum industry would rise further under legislation mandating the reduction of sulfur dioxide emissions. Approximately one-half of U.S. smelting capacity relies on coal-generated electricity in its production process. Based on a 12-million ton reduction in emissions, electricity rates to some smelters would be increased as much as 13 percent, causing the average cost of primary aluminum produced in the United States to rise by 3.8 percent.

Measures to curb potential climate changes that may occur due to global warming caused by the production of greenhouse gases would have adverse impacts on the aluminum industry equal to, or greater than, those from reducing sulfur dioxide emissions, since it is the burning of fossil fuels, principally coal, which contributes to the accumulation of these gases. Unfortunately, the remedies for controlling sulfur dioxide emissions do not coincide with those for limiting greenhouse gas emissions.

Another environmental concern involves the Basel Convention, an accord that will significantly limit international trade in scrap and secondary metals, including aluminum. Under terms of the Convention, the export of any material defined as hazardous may only occur if disposal facilities do not exist in the country of origin, and the importer has such facilities. This could have a major effect on U.S. aluminum trade. In 1990, U.S. exports and imports of aluminum waste and scrap totaled 725,000 metric tons.

INTERNATIONAL COMPETITIVENESS

The import volume of ingot and semifabricated aluminum reversed the trend of the last few years and increased 1.6 percent in 1990. The increase was due solely to a surge in can stock imports from Japan. Ingot imports were flat, but semifabricated imports rose 5.4 percent, due mostly to an increase in can stock imports from Japan.

Conversely, U.S. exports of ingot and semifabricated aluminum increased 14 percent. This increase was completely a result of the 26 percent increase in ingot exports; semifabricated exports exhibited no change. The increase in ingot exports is due to the strong demand for primary aluminum in Japan, which has virtually no domestic smelting capacity, as well as weak demand in the United States, and the depressed value of the dollar.

The United States mill product industry is a modern and efficient producer of high-quality products with an international production advantage. Until 1983, the United States was a net exporter of aluminum mill products. Since then, however, the industry has had difficulty in competing against foreign producers who are aided by their governments through subsidies on investments and policies designed to limit market access. Thus, U.S. exporters not only have limited access to the countries with trade-restrictive policies, but are also at a disadvantage when competing in third markets against these countries, which, in addition, have relatively free access to the U.S. market. As a result, the United States is the favored market of last resort for the world's production. In spite of this, the United States again maintains a positive trade balance in mill products. In order to increase market access, the industry sought the reduction of tariffs and nontariff barriers, especially by the European Economic Community and Japan, in multilateral negotiations in 1989.

Outlook for 1991

U.S. aluminum shipments are expected to remain level in 1991 at approximately 6.8 million metic tons (15.0 billion pounds). Demand in the United States will remain sluggish, especially in two major end-use sectors, transportation equipment and construction. The containers and packaging sector will remain the dominant end-use sector for aluminum, exhibiting moderate growth. Exports, which in the past few years have been a key factor in offsetting the declines in domestic shipments, will provide little additional growth in 1991.

Long-Term Prospects

U.S. aluminum shipments are expected to increase at a compound annual rate of approximately 3 percent through 1995. Shipments of aluminum to the container and packaging sector will remain the largest end-use for aluminum. Growth in the demand for beverage cans should offset any reduction in thickness of can stock or material substitution. Additionally, one of the aluminum can's greatest assets, its recyclability, should ensure its continued use.

Efforts are underway to use aluminum in new packaging and products. Some of the decline in aluminum use in vehicles because of reductions in auto production will be offset by increases in the amount of aluminum contained in each vehicle. As an example, Ford will begin using aluminum for the hoods of some of its larger 1991 models. Shipments to the auto sector may also increase if Japanese transplant assembly plants in the United States obtain parts from U.S. companies.

The aluminum industry is also attempting to develop new markets. All the major integrated aluminum producers are now casting ingots of aluminum-lithium alloys, which offer greater stiffness and lighter weight than conventional aluminum alloys. The advantages of these products are their ability to be formed and rolled like aluminum.

It is not likely that reductions in defense spending will have a significant impact on the aluminum industry. The major use of aluminum by the military is in aerospace applications, and this accounts for only just over 1 percent of total aluminum shipments.

The domestic aluminum industry will continue to modernize and to emphasize value-added mill products. Many integrated companies will diversify into related fields, such as advanced composite materials and packaging. As an example, Alcoa and Akzo, a Dutch company, have agreed to produce and market fiber-aluminum laminates for the aerospace industry. Akzo will provide the fiber technology. Another aluminum company has started production of a metal matrix composite using aluminum as the matrix material.

Primary producers in the U.S. will experience continued competitive pressures. Venezuela, probably the world's lowest-cost producer, has announced a goal to produce 2 million metric tons of aluminum annually by the year 2000. It is likely that Canada will achieve this milestone even sooner.

Despite announcements of new capacity construction worldwide, supply and demand should remain in relative equilibrium, with increases in worldwide demand compensating for weaker U.S. markets. This may provide an impetus for higher prices before some of the new smelters and capacity expansions are ready for operation, especially if the capacity additions planned for the Middle East are not completed as scheduled due to the Iraqi crisis. Increased production costs to U.S. manufacturers as a result of compliance with legislation limiting sulfur dioxide emissions will also affect industry performance.—*David A. Cammarota, Office of Metals, Minerals, and Commodities, (202) 377-0575, September 1990.*

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COPPER

Copper industry products (SIC 1021, 3331, 3341, 3351, 3357) are used primarily for their electric conductive, corrosion-resistant, and heat-transfer properties. Copper products can be divided into 6 categories: unwrought copper (ores, concentrates, matte, blister, anodes, and cathodes); wire mill products (wire rod, bare wire, and insulated wire and cable); copper and brass mill products (sheet, strip and plate, rod and bar, pipe and tube, and mechanical wire); foundry products; ingots; and powder. Electrical and electronic products, building construction, industrial machinery and equipment, transportation equipment, and consumer and general products are the primary end uses of copper.

Table 6: Copper and Copper Alloy Shipments to U.S. Markets

Percent of Total Shipments by Weight

	1980	1989
Building Construction	32.6	41.3
Electrical & Electronic Products	27.6	23.9
Industrial Machinery & Equipment	17.0	13.5
Transportation Equipment	10.7	11.5
Consumer and General Products	12.1	9.8
Total	100.0	100.0

Sources: Copper Development Association Inc.; U.S. Department of Commerce, Bureau of the Census.

Note: Includes imports of mill products to the U.S. and excludes exports from the U.S.

U.S. copper consumption was approximately 2,084,000 metric tons in 1990, down approximately 4.4 percent from 1989's consumption of 2,180,000 metric tons. Primary and secondary production of refined copper in the U.S. changed little from the prior year's level of approximately 1,900,000 metric tons. World consumption of copper was approximately 11,000,000 metric tons, up approximately .5 percent from the prior year. World production of primary and secondary refined copper increased from approximately 10,700,000 metric tons in 1989 to 10,880,000 metric tons in 1990. World mine production of primary copper increased from approximately 8,900,000 metric tons to 9,150,000 metric tons.

Copper prices on the New York Commodity Exchange (COMEX) and the London Metals Exchange (LME) moved within a wide range during the year, but on average were lower in 1990 than in 1989; the COMEX price averaged $1.15 per pound during the first half of 1990 compared with $1.32 during the same period in 1989. The close balance between supply and demand for the second year in a row, production shortfalls in Chile, and a steady stream of supply interruptions around the world supported prices and prevented the kind of price declines that have occurred in the past. Market speculation was also important during certain periods. World conditions created a paradox in the U.S. market, firm and relatively high copper prices during a period of declining demand.

Table 7: Consumption of Refined Copper in the U.S. by Product

Percent of Total Consumption by Weight (Copper Content)

	1970	1980	1990[1]
Wire Mill Products	65.3	70.1	78.1
Brass Mill Products	32.2	27.4	19.9
Ingot Makers	.3	.3	3
Foundries	1.2	.9	.7
Powder Plants	.3	.4	.3
Other Industries[2]	.7	9	.7
Total Products	100.0	100.0	100.0

[1] Estimate.

[2] Chemical, Steel, aluminum and other products.

Sources: U.S. Department of the Interior, Bureau of Mines; American Bureau of Metal Statistics; U.S. Department of Commerce, Bureau of the Census; Copper Development Association Inc.

Three of the 5 major markets for copper and copper alloy products, building construction, transportation equipment, and industrial machinery and equipment declined significantly during 1990; also shipments of most electrical and electronics products and consumer and general products were flat or experienced moderate declines. Consequently, overall domestic demand for wire mill and copper and brass mill products was down by approximately 15 percent in 1990. In addition, brass mills had to adjust to changes in the method of pricing zinc slab, creating some further uncertainty. There were, however, no signs of a full-blown recession in mill markets, and certain positive signs did appear. Capacity closures in the early part of 1990 helped to mitigate the effects of declining demand for brass mill products and productivity improvements enabled some mills to maintain profits. Demand in the air-conditioning and refrigeration and home refurbishing markets lent support to pipe and tube shipments, and sales of sheet and strip benefited from stable demand in some segments of the electrical and electronics market.

Table 8: Shipments of Wire Mill and Brass Mill Products to U.S. Markets

Percent of Total Shipments by Weight

	Wire Mill	Brass Mill
Building Construction	37.8	45.9
Electrical & Electronic Products	31.5	18.5
Industrial Machinery & Equipment	10.9	11.6
Transportation Equipment	11.8	11.5
Consumer & General Products	8.0	12.5
Total	100.0	100.0

Sources: Copper Development Association Inc.; U.S. Department of Commerce, Bureau of the Census.

Includes imports of mill products to the U.S. and excludes exports from the U.S.

Stability in the amenities index, a key indicator of the installation and use of household and office conveniences, and stronger exports also helped sales of mill products.

INTERNATIONAL COMPETITIVENESS

Historically the United States has been a net importer of unwrought copper (copper ores, concentrates, matte, blister, and refined copper) and brass mill and wire mill products. The United States has been a net exporter of copper scrap. Over the past two years, however, the United States has moved into a near balance of trade, or accumulated small surpluses, in unwrought copper and wire mill products. In 1990, the U.S. copper industry benefited from stronger demand for unwrought copper in Japan and Taiwan, as well as in other markets. Canada and Mexico continued to be the main markets for U.S. exports of wire mill products, but significant gains were achieved in exports of certain wire mill products to the United Kingdom, Taiwan, Argentina, Philippines, Spain, and Saudi Arabia.

In copper and brass mill products, exports of copper and copper alloy plate sheet and strip reached near-record highs, although the U.S. was still a net importer of mill products. Canada was also the largest export market for U.S. brass mill products. Brass mill exports to the Asian NICs, especially to Taiwan, more than doubled from levels of a year ago, but exports to Japan and the European Economic Community (EC) declined approximately 10 percent. Total brass mill exports increased approximately 12 percent.

In 1990, imports of refined copper rose slightly, but there was a moderate decrease in imports of brass mill and wire mill products. Antidumping and countervailing duties remained in place on certain brass mill products, principally brass sheet and strip. Domestic brass mills, especially producers of strip and rod, continued to feel the effects of indirect imports of mill products.

With regard to other international trade issues, the U.S. copper mining industry called for greater disciplines over state trading and liberalization of foreign investment in mining. During the year the U.S. extended GSP duty-free treatment to include stranded copper wire from Peru under the Special GSP Andean Review. Foreign investment in the U.S. copper industry increased during 1990 as European and Asian firms invested in U.S. brass mills and Mitsubishi Metals Corporation continued work on the Texas City Smelter. The smelter is scheduled to come on line in 1992. Mitsubishi Metals also obtained a majority interest in the Cox Creek Refinery, which will process copper anode from the Texas City Smelter. Work continued on formation of an International Copper Study Group (ICSG). Several nations, including the United States, Chile, and Peru, notified the United Nations Council on Trade and Development of their intention to join the group.

Outlook for 1991

Domestic copper consumption is expected to rebound slightly, by approximately 1 percent to 2,105,000 metric tons in 1991, and domestic primary and secondary refined production may increase to approximately 2,100,000 metric tons, up from approximately 1,900,000 metric tons in 1990. According to most estimates, the close balance between world supply and consumption which has existed since 1988 is expected to shift, with supply exceeding demand and moderate surpluses developing. In the United States, production is likely to grow faster than consumption, and net imports of refined copper and most mill products will probably continue along the downward trend that began in 1988.

Exports of refined copper, especially to Japan and Taiwan, and exports of wire mill and brass mill products spread across many markets seem likely to continue along an upward trend, perhaps increasing by approximately 12 percent, 7 percent and 10 percent respectively. U.S. imports of refined copper may increase by approximately 3 to 4 percent in 1991, but imports of mill products will probably continue to decrease as large producers in the EC and Japan devote capacity to satisfying stronger demand in their home markets.

The Escondida copper mine in Chile will complete its first full year of operation in 1991, adding approximately 320,000 tons of recoverable copper to world supply. In terms of the effect on U.S. copper flows, a portion of the production will be shipped to Mitsubishi's Texas City smelter beginning in 1992 and some will be shipped directly to Japan, potentially displacing U.S. exports. The U.S. currently accounts for approximately 10 to 15 percent of Japan's imports of copper ores and concentrates.

Long-Term Prospects

There is a wide range of opinions concerning the net gain or loss to copper consumption resulting from changes in technology in the current and future markets for copper. The switch to fiber-optic telecommunication cable, often cited as a competitive threat to copper consumption, may actually create additional demand for copper. Since fiber-optic cables cannot yet be used to transmit electrical energy, substantial quantities of copper wire are used in conjunction with fiber-optic cable to carry the electricity needed to generate light for the signal. Despite pressure from substitution and other technological and economic factors, future estimates of growth rates in both U.S. and world copper consumption appear to be favorable for the industry. Between 1991 and the year 2000, U.S. consumption is expected to grow at an annual rate of approximately 2 percent; world consumption is expected to grow at an annual rate of approximately 2.7 percent. In comparison, the annual growth rate of U.S. consumption was flat from 1980 to 1989, although consumption in the second half of the decade was much stronger than in the first. The annual growth rate of world consumption from 1980 to 1989 was approximately 2.2 percent.

Between 1991 and 2000, U.S. copper mining capacity is expected to increase by approximately 9.8 percent for an average annual growth rate of approximately 1.04 percent. World mine capacity is expected to increase by approximately 5.3 percent for an average annual growth rate of approximately 0.6 percent. The largest capacity increase is expected in Chile where mine capacity is expected to increase by approximately 25 percent, largely due to the opening of the Escondida Mine, and expansion at El Teniente Mine. Many U.S. copper producers have already embarked on expansion and renovation projects in order to reduce production costs and increase productivity over the long term.—*Brian Duggan, Office of Metals, Minerals, and Commodities, (202) 377-0575, September 1990.*

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LEAD

At the beginning of the 1990s, the U.S. lead industry was fundamentally different than during most of the 1980s. The industry is increasingly tied to a single end-use (the lead-acid battery) while the secondary sector of the industry has shifted from a position of near equality with the primary sector to become the dominant force in the production of lead. The domestic market was nearly balanced as imports declined and exports continued their steady climb.

Domestic production of unwrought lead in 1990 increased about 4 percent, to 1,255,000 metric tons. Primary production remained steady, with the two domestic producers (Asarco and Doe Run) operating at near full capacity. Secondary production, which currently accounts for around 69 percent of total unwrought production (compared to 47 percent in 1970 and 55 percent in 1980), rose 6.3 percent in 1990 following an increase in capacity by a number of secondary producers during the past 3 years. Domestic lead mine production increased 20 percent to an estimated 495,000 metric tons as Cominco's Red Dog mine in Alaska was opened for production. All of Red Dog's production will be exported to Canada and the Pacific Rim.

Domestic lead consumption fell less than 1 percent in 1990 to 1,276,000 metric tons, reflecting continued weakness in the automotive market that is the primary end-user of lead-acid batteries. The demand for lead by the storage battery industry, which now accounts for 79 percent of total domestic lead demand (compared to 43 percent in 1970 and 60 percent in 1980), declined slightly due to a significant decrease in the production of original equipment automotive batteries and a smaller decline in industrial batteries. Production of replacement batteries (the dominant sector of the lead-acid storage battery industry), however, increased about 9 percent as a result of a warm summer and an increase in the number of vehicles in operation.

Although the use of lead in shot for ammunition is being phased out, shipments remained steady due to an increase in the amount of lead shot used as a shield against radioactivity in the nuclear industry. Lead consumed in oxides (the third largest end-use market with, 4.7 percent of total consumption) increased about 3 percent. Other end-uses (which account for the remaining 11 percent of consumption) remained level compared with 1989.

During the first quarter of 1990, the domestic lead price rose from 39 cents per pound to 65 cents per pound (the highest level since the record high of 67 cents per pound set in December 1979) due to anticipated spot shortages of lead. The price dropped back to the January level in April and then increased gradually to just over 50 cents per pound at the beginning of the third quarter. The price remained steady the remainder of the year, resulting in a 22 percent increase in the average annual producers price from 39.4 cents per pound in 1989 to 48.1 cents per pound in 1990.

Environmental Issues

In 1990 a number of bills were introduced in Congress that affect the lead industry or the primary end-use of lead, the lead-acid battery. Most notable of these was the Lead Exposure Reduction Act of 1990, which was introduced in both the Senate and the House. If enacted, this bill would restrict the use of lead in a number of applications such as paint, plumbing fittings, pesticides, toy and recreational game pieces, and curtain weights. The legislation also supports recycling by mandating the collection of lead-acid batteries and outlawing the disposal of batteries in landfills.

The number of batteries not entering the recycling chain is minimal. The Department of Commerce estimates that the recycling rate for lead-acid batteries rebounded from near 80 percent in 1985 to about 100 percent in 1989 as a result of higher lead prices and an increase in secondary capacity and scrap battery exports.

Table 9: Trends and Forecasts: Lead

(in thousands of metric tons except as noted)

Item	1987	1988	1989	1990[1]	1991[2]	1995[2]
Mine Production	313	385	411	495	520	550
Total refined production	1,084	1,129	1,205	1,255	1,265	1,325
Primary	374	392	396	395	385	390
Secondary	710	737	809	860	880	935
% Secondary	65.5	65.3	67.1	68.5	69.6	70.6
Consumption	1,230	1,231	1,283	1,276	1,292	1,385
% Lead-Acid Battery	77.5	78.8	78.9	79.2	79.7	82.3
Imports for consumption:						
Unwrought[3]	197	153	116	80	90	80
% of consumption	16.0	12.4	9.0	6.3	7.0	5.8
Scrap (lead content)	7	7	12	10	20	25
Exports:						
Unwrought	4	6	34	60	65	90
Scrap (gross weight)	53	82	60	58	30	20
Year end stocks (primary, (secondary, and consumer)	110	106	98	91	91	90
U.S. producer price (cents per pound)[4]	35.9	37.1	39.4	48.1	—	—

[1] Estimate.

[2] Forecast.

[3] Includes base bullion and pigs and bars.

[4] *Metals Week* average.

SOURCES: U.S. Department of Commerce: International Trade Administration (ITA); U.S. Bureau of Mines; *Metals Week.* Estimates and forecasts by ITA.

INTERNATIONAL COMPETITIVENESS

For the third consecutive year, imports of unwrought lead decreased, falling 31 percent in 1990 to 80,000 metric tons, with Canada and Mexico (traditionally the major foreign suppliers) accounting for almost all of these imports. Exports of unwrought lead, however, rose 76 percent to 60,000 metric tons, with the largest share going to the Pacific Rim, Canada, and Europe.

Imports of lead-acid batteries have increased dramatically since 1983, rising from 4.6 million units to around 14 million units. Almost 90 percent of these imports came from Japan, Taiwan, Mexico, and South Korea. Exports of lead-acid batteries, on the other hand, decreased about 20 percent to about 2 million units.

Outlook For 1991

Lead consumption is expected to increase about 1.3 percent in 1991, to 1,292,000 metric tons. Production of original equipment batteries is expected to remain flat, reflecting continued weakness in the transportation sector, while replacement battery shipments should increase almost 1.5 percent as the number of vehicles in operation (which is growing 1-2 percent annually) increases. Severe weather could also affect sales, given the positive relationship between extreme temperature fluctuations and replacement battery demand.

Unwrought lead production is expected to increase almost 1 percent to 1,265,000 metric tons. Secondary lead production should account for almost 70 percent of total production as RSR, a major secondary producer of lead, expands capacity at some of its smelters and Doe Run begins producing secondary lead. Domestic mine production is expected to increase around 5 percent as Red Dog increases its production. U.S. imports of unwrought lead are expected to increase slightly to 90,000 metric tons, while exports are expected to climb to 65,000 metric tons, reflecting the increase in secondary production.

Long-Term Prospects

U.S. consumption of refined lead is forecast to expand about 1.8 percent per year, to about 1,385,000 metric tons in 1995 (Table 9). Storage batteries will continue to be the largest end-use sector, growing in significance as other end-uses contract or remain flat.

The demand for automotive storage batteries over the long run will depend on, among other things, the growth and age of the motor vehicle fleet, extreme temperature fluctuations, and the service life of the battery itself. The size and amount of lead per battery will probably remain constant in the near-term but may increase slightly as the major automobile producers demand higher reserve power for cold weather starts and better life to handle the increasing power drain from electrically powered accessories.

Market expansion possibilities for lead-acid batteries do exist. Two such uses are batteries used as a power source for industrial trucks, and stationary uninterruptable power supply (UPS) batteries for such applications as backup power to computer and communication systems. One of the most promising developments associated with stationary batteries is the 2,000 ton load leveling battery being tested at an electric substation in California which, if successful, could boost the demand for lead significantly by the end of this century.

Several new uses for lead show long-term potential and could prove to be beneficial to the environment. With a renewed emphasis on energy conservation and supply as a result of Iraq's invasion of Kuwait, electric vehicles powered by lead-acid batteries could attract renewed interest. Lead sheet may also prove to be an effective material for use as a barrier to retard radon gas entry into homes.

Lead may eventually be used as a stabilizing agent in road asphalt and asphalt roofing shingles. Laboratory tests have shown that the lead compound diakyldithiocarbamate (LDADC), which prevents hardening and cracking in asphalt, can double the life of asphalt while adding only 4 to 5 percent to its cost. Although less than 1 pound of lead per ton of asphalt would be used, 30 million tons of asphalt pavement are laid annually in the United States. Road tests of this material are being carried out.

A prototype flat roof that would combine the proven waterproofing benefits of sheet lead with the latest in state-of-the-art insulation has been constructed by the Lead Industries Association. This roof has been designed to provide long-term, low-maintenance service. In the near future, the domestic roofing market will need 2.8 billion square feet of coverings annually.—*David A. Larrabee, Office of Metals, Minerals, and Commodities, (202) 377-0575, September 1990.*

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NICKEL

The United States lacks the resource base to be a major primary nickel producer. However, in 1990 production increased to about 4,500 metric tons, primary nickel consumption declined about 5 percent to 101,000 metric tons, and prices were mixed, averaging between $4.00 and $4.20 per pound.

There has been no nickel mine production in the United States since 1986, when M. A. Hanna Company closed the Riddle, Oregon ferronickel mine and smelter complex. U.S. plant production rose to about 4,200 metric tons of nickel in ferronickel, as Glenbrook Nickel, Inc., began its second year of operations at the Riddle, Oregon complex using stockpiled low-grade ore that had been rejected by M. A. Hanna. Searching for higher-grade ores to import and significantly reduce production costs, Glenbrook officials visited potential suppliers in Australia, Indonesia, and New Caledonia; however, no supply agreements were announced. Cominco Ltd. now owns the Glenbrook complex, having purchased USA Investments, Inc.'s, 50-percent interest.

U.S. primary nickel consumption was an estimated 101,000 metric tons in 1990, down about 5 percent from 1989. About three-quarters of U.S. stainless steel contains nickel, and nearly half of U.S. primary nickel is used to produce stainless steel. Stainless steel production in the United States declined about 4 percent to 1.7 million metric tons but, owing to tight

Table 10: Trends and Forecasts: Nickel

(in metric tons of contained nickel, except as noted)

Item	1986	1987	1988	1989[1]	1990[2]	1991[3]	1995[3]
United States:							
Mine shipments	1,066						
Plant production:							
Domestic ores	1,498			347	4,200	5,400	8,000
Imports for Consumption:							
Primary	117,112	139,793	139,047	136,047	144,000	150,900	155,000
Mill Product (Gross Weight)	5,978	4,939	4,842	4,688	5,200	4,900	4,200
Waste and Scrap (Gross Weight)	6,164	6,865	8,401	10,280	8,800	9,200	10,700
Consumption:							
Reported:							
Primary	97,125	118,391	113,870	106,139	101,000	106,200	110,000
Secondary (Purchased Scrap)[*]	28,870	31,131	39,658	38,228	36,000	35,000	40,000
Apparent:							
Primary	124,812	141,391	120,156	107,467	106,300	111,800	115,800
Secondary (Purchased Scrap)[*4]	39,666	42,327	57,433	56,591	54,000	52,300	60,000
Exports:							
Primary	2,551	2,189	2,468	2,111	5,700	7,200	10,700
Mill Product (Gross Weight)	6,743	8,969	11,286	28,203	16,400	18,000	30,400
Waste and Scrap (Gross Weight)	9,525	10,470	11,596	14,753	18,500	20,000	27,000
Stainless Steel Scrap[5]	11,254	11,721	16,557	19,841	13,446	15,700	20,000
Consumer Stocks, Yearend:							
Primary	15,020	9,428	10,885	8,844	8,500	9,200	8,700
Secondary	4,236	3,969	4,618	4,813	4,200	4,400	4,700
World:							
Mine Production	788,610	825,501	872,115	931,970	919,100	966,000	968,300
Plant Production[2]	741,523	735,700	859,706	864,397	854,800	898,100	900,500
Primary Consumption[2]	732,300	792,000	885,000	864,400	862,800	897,800	938,000
Prices (Dollars Per Pound):							
New York Dealer Cathode[6]	1.86	2.28	6.09	6.05	–	–	–
London Metal Exchange[7]	1.76	2.19	6.25	5.98	–	–	–

[*] Estimated

[1] Preliminary

[2] ITA Estimate

[3] ITA Forecast

[4] Secondary exports included in apparent consumption beginning 1988

[5] Nickel content of stainless steel scrap is considered to be 7.5%

[6] New York dealer cathode average calculated by *Metals Week*.

[7] London Metal xchange average nickel contract price.

SOURCE: U.S. Bureau of Mines, except as noted.

scrap supplies, stainless steel's reported use of primary nickel increased about 4 percent to about 41,500 metric tons, and its share of the total reported primary nickel consumption increased 3 percentage points to 41 percent.

Reported U.S. primary nickel usage in 1990 also rose for superalloys and alloy steel, up 40 percent and 7 percent to 15,100 and 6,200 metric tons, respectively. Nonferrous alloys use of primary nickel declined 5 percent to about 20,700 metric tons. Reported sales to electroplaters declined 22 percent, largely the result of sluggish automobile sales, to about 16,900 metric tons and its share of the total primary nickel consumed declined 3 percentage points to 17 percent. Superalloys share of the total reported primary nickel consumed increased 5 percentage points, to 41 percent, while alloy steel's and nonferrous alloy's share of the total reported U.S. primary nickel consumption were unchanged from 1989 levels at 6 and 21 percent, respectively.

The reported 1990 U.S. primary nickel consumption pattern was similar to that of 1989. Pure unwrought nickel consumption (consisting primarily of cathodes but also including pellets, briquets, and powder) declined about 10 percent to 78,900 metric tons and was down 4 percentage points to a 78-percent share of total reported primary consumption. Ferronickel usage increased about 63 percent to 16,600 metric tons and was up about 6 percentage points to a 16-percent share of total. While nickel oxides accounted for the bulk of the balance, oxide consumption was down 46 percent to 3,200 metric tons and fell about 3 percentage points to a 3-percent share of the total reported U.S. primary nickel consumption in 1990.

U.S. stainless steel producers used a greater proportion of primary nickel in 1990 to meet their nickel requirements. Primary nickel was used for about 43 percent of the stainless steel industry's nickel requirements, versus about 41 percent in 1989. In 1987 inadequate scrap supplies forced U.S. stainless steel producers to obtain as much as 50 percent of their nickel from primary nickel.

Stainless steel producers prefer to use the highest level of scrap possible in their production because stainless steel scrap is generally cheaper than the sum of its primary components (nickel, chrome, and iron) and requires less energy to melt. While the availability and price of stainless steel scrap and primary nickel are fairly stable, the charge for an electric furnace is made up of proportions of scrap and primary metal that is fairly consistent. But when the availability or cost of either scrap or primary metal changes significantly stainless steel producers will adjust the mix of their charge materials to achieve the lowest possible production costs.

Changes in the stainless-steel scrap cycle cause exaggerated fluctuations in the demand for primary nickel. Stainless-steel scrap and Class 2 nickel (mainly ferronickel and oxides) are both used almost exclusively in the production of stainless steel. The ready availability of nickel in stainless-steel scrap during the final of months of 1989 and early 1990 due to curtailed stainless-steel production, led to a substantial surplus of primary nickel. As stainless-steel production recovered, stainless scrap became scarce and the demand and prices for primary nickel began to rise.

INTERNATIONAL COMPETITIVENESS

Excluding Glenbrook's ferronickel production, the United States is totally dependent on imports for its primary nickel requirements. U.S. primary nickel imports in 1990 increased about 6 percent in quantity but decreased about 27 percent in value, owing to lower primary nickel prices, to 144,000 metric tons at $1.16 billion. The principal sources of U.S. primary nickel imports are Canada, Norway, and Australia for unwrought nickel; the Dominican Republic and New Caledonia for ferronickel; and Canada and Australia for nickel oxides.

Cuba, which is a major exporter of nickel, is barred from the U.S. market by the Cuban Assets Control Regulations of the Trade Embargo Act of 1962. The embargo affects trade with other countries as well, since it prohibits the importation of Cuban raw materials, either directly or as components of manufactured products from other countries. For nearly seven years the U.S. banned the importation of nickel produced in the U.S.S.R. because the Soviets were known to blend in Cuban raw materials. However, in June of 1990, through an exchange of letters, the United States and the U.S.S.R. established a mutually agreed upon certification procedure that would allow for the importation of Soviet nickel. The agreement could result in lower U.S. nickel prices if U.S. imports of Soviet nickel become sufficiently large, although U.S. import tariffs and product specifications could mitigate this development.

Although the United States lacks a substantial, commercially exploitable nickel resource base, it remains a major manufacturer and exporter of nickel-based mill products. The relatively low value of the U.S. dollar has continued to assist U.S. nickel-mill product exports, while discouraging imports. In 1989, U.S. nickel-based mill product imports were valued at $79 million, while exports were $238 million, a record export value exceeding the 1988 value by $100 million. This gave the U.S. a net nickel-based mill products trade surplus of about $159 million, up $92 million from 1988. The 1990 U.S. nickel-based mill products trade balance declined an estimated 52 percent in quantity, but, increased owing to higher nickel alloy prices, about 5 percent in value to an estimated $167 million.

U.S. nickel-based mill product imports in 1990 increased about 9 percent in value to an estimated $86 million. U.S. exports of nickel-based mill products increased about 7 percent in value to an estimated $253 million, possib another record year. These higher nickel-based mill produ export values are a direct result of the higher primary nick prices of 1988 and 1989, passed on to nickel alloy users vi higher base prices and surcharges.

Table 11: World Mine Production of Nickel by Principal Producing Countries

(in metric tons of contained nickel)

Country	1986	1987[1]	1988[2]	1989[3]	1990[3]
Australia (content of concentrate)	76,739	74,554	62,358	67,041	64,900
Botswana (content of matte)	25,558	25,920	25,971	26,036	25,200
Canada[4]	163,639	189,085	218,556	203,546	194,700
Cuba (content of oxide sinter and sulfide)	32,218	33,824	41,758	43,001	43,000
Dominican Republic	21,878	32,521	29,302	32,024	32,000
Indonesia (content of ore)[5]	53,679	57,764	57,982	64,319	62,300
New Caledonia (recoverable)	61,779	56,880	67,676	125,010	121,000
Philippines	12,790	7,819	10,796	13,971	13,500
South Africa, Rep. of[2]	31,026	34,292	34,836	35,471	34,300
U.S.S.R. (content of ore)[2]	195,045	205,024	215,003	215,003	221,300
United States (content of ore shipped)	1,066				
Other	113,193	107,818	107,877	106,548	106,900
Total	788,610	825,501	872,115	931,970	919,100

[1] Preliminary.

[2] Estimated.

[3] ITA estimate.

[4] Refined nickel and nickel content of oxide and salts produced, plus recoverable nickel in matte and speiss.

[5] Includes a small amount of cobalt not reported or recovered.

Source: Bureau of Mines, except as noted.

Nickel waste and scrap exports were valued at $46 million i 1989, while imports were $78 million. In 1990 U.S. exports c nickel waste and scrap were an estimated $40 million an imports an estimated $51 million, for a nickel waste and scra trade balance net deficit in value at $11 million, down 6 percent from 1989's deficit. This net deficit in nickel wast and scrap trade is typical as U.S. imports tend to be higher valued segregated alloy scrap used as feedstock by nickel based alloy manufacturers, while exports tend to be lower valued material, such as contaminated alloys, dross, flue dust, and bag house residues from nickel-based alloy manufacturers; these materials are exported to primary nickel refineries for use as feedstock.

Although nickel is one of the most important minerals in world trade, there has not been an international organization to provide statistical data or a forum for intergovernmental consultations on the metal. After 10 years of intermittent negotiations, the International Nickel Study Group (INSG) was established in June 1990 at The Hague, the Netherlands. The 12 founding members were Australia, Canada, Cuba, Finland, France, Germany, Greece, Indonesia, Japan, the Netherlands, Norway, and Sweden. A number of countries still have not joined, including major consumers such as the United States, the United Kingdom, and the U.S.S.R., as well as 6 developing nations with significant nickel resources and production capacity (the Dominican Republic, Colombia, Zimbabwe, Botswana, the Philippines, and Brazil). While the current 12 members represent at most 61 percent of world nickel trade, the continued fluctuations in the nickel market, increased concerns about improving international nickel data, and the need for international discussions on nickel-related issues have enhanced the prospect that other nations will join the INSG.

High production rates and increased net exports of primary nickel from the Soviet Union and Cuba, about 95,000 metric tons, kept the nickel market in the West in balance during 1989. However, reduced demand for stainless steel in the second half of 1989 resulted in cuts in U.S. stainless steel production, lower industrial scrap generation, and a minor surplus of primary nickel.

World mine production of nickel declined about 1.4 percent, to 919,100 metric tons, and plant production declined by 1.1 percent to 854,800 metric tons in 1990. About two-thirds of the world's nickel mine and plant production occurs in the Western world, and the bulk of the remaining nickel is produced in the Soviet Union. Nickel mine production in the West was about 616,400 metric tons in 1990, down about 3.1 percent. Primary nickel plant production in the West declined by an estimated 1.7 percent to 554,800 metric tons. The operating rate was about 90 percent of effective capacity, down 3 percentage points from a slightly lower effective capacity in 1989.

Both world and Western world primary nickel consumption declined slightly, about 0.2 percent each in 1990, to 862,800 and 647,800 metric tons, respectively. About three-quarters of the West's stainless steel production is austenitic, or nickel-bearing, and about two-thirds of its primary nickel use is to manufacture nickel-bearing stainless steel.

After declining about $4.50 per pound during 1989, London Metal Exchange (LME) nickel prices continued to decline into February 1990, when prices dropped to an average of $3.17 per pound for the month. Increase in nickel demand pushed LME prices up to an average of $4.20 per pound in March. LME prices then fell through June to average $3.18 per pound, due to the combined effects of lower-priced scrap, surplus ferronickel, and the exceptionally high levels of Soviet nickel being delivered onto the LME.

During the first 5 months of 1990 LME nickel stocks generally increased. Nickel stocks stood at 6,798 metric tons on January 5 and increased to 9,324 metric tons by May 15. Through July 17 nickel stocks tended to stay within a narrow 1,000 metric ton range, peaking at 9,072 metric tons on June 12 and falling to 8,271 metric tons on June 26. Then, beginning in mid-July, Soviet deliveries to the LME began to fall off and LME stock levels steadily declined. At the time it was difficult to determine whether the Soviets had begun to ship nickel directly to major consumers in the West or if Soviet exports to the West actually fell.

Normally the nickel market is quite during the third quarter when both producers an consumers tend to conduct needed maintenance and repairs, and nickel demand and prices drift into a summer lull. However, during the third quarter of 1990 several industry developments led to a heated market. In addition to the falling LME stocks, concern over nickel supplies emerged as a result of production disruptions and uncertainties at nickel facilities around the world.

In New Caledonia, a strike at Societé Metallurgique le Nickel's (SLN) Doniambo smelter led it to declare a force majeure on June 22. The strike began on June 17 and lasted five weeks. After the strike, technical problems delayed the smelter's return to full production. SLN, the world's largest ferronickel producer, is estimated to have lost about 4,200 metric tons of contained nickel or about 15 percent of its projected production for 1990. Ferronickel production was already expected to be reduced during the third quarter because Falconbridge Ltd., the world's second largest ferronickel producer, had announced that beginning July 1 it would shutdown one of its three ferronickel furnaces at its Falcondo operations in the Dominican Republic for maintenance and repairs. The furnace shutdown was planned to last twelve weeks and reduce production by about 10 percent, to 28,000 metric tons.

In Canada, Sherritt Gordon closed its Fort Saskatchewan, Alberta nickel refinery during July and August due to a lack of feed. Sherritt Gordon relies on purchased raw materials to operate its refinery. The shutdown cut Sherritt Gordon's production by about 9 percent to an estimated 18,000 metric tons. Elsewhere in Canada, over an 8-week period during August and September the United Steel Workers Union at Inco Ltd.'s Thompson, Manitoba, operations negotiated a new contract. While a strike was averted the extended negotiations helped fuel the market. Inco's Thompson operations produced about 52,000 metric tons of nickel in 1990, down 15 percent from the 1989 level of 61,000 metric tons.

In Indonesia, a furnace explosion at P. T. Inco's Soroako matte smelter in late-August resulted in the loss of about 4,000 metric tons of nickel in matte. The smelter was six days into a five-week maintenance period when the explosion occurred. A water leak was believed to have been the cause. If the furnace had been fully operational, the loss could have been much worse.

Apparently, concern over the future availability of nickel drove many consumers to the market, forcing LME stocks to fall and prices to rise. Compounded by the lack of deliveries from the Soviet Union, LME nickel stocks fell 6,500 metric tons or about 75 percent between July 17 and September 18 to 2,076 metric tons. During the third quarter LME nickel prices increased to average $4.97 per pound for August and $4.92 percent pound for September.

Outlook for 1991

The nickel market will probably remain chronically tight in 1991. Both consumption and production will increase on the strength of rising demand for stainless-steel production. Primary nickel consumption worldwide will rise about 4 percent, approaching 900,000 metric tons. In the West, consumption will increase about 6 percent to 685,000 metric tons, while reported U.S. primary nickel consumption will rise about 5 percent to 106,200 metric tons. Primary nickel consumption and imports in the United States will increase as a result of strong demand from both the steel and nonsteel sectors. U.S. imports of primary nickel will increase about 5 percent to 150,900 metric tons. Higher demand and rising prices will spur increased plant capacity and production in 1991, assuming there are sufficient feedstocks, and the average operating rate will probably rise to about 92 percent of effective capacity. Glenbrook Nickel will most likely find an ore supply and will produce about 5,400 metric tons of nickel in ferronickel. World primary nickel production will also increase, rising about 4 percent to 885,000 metric tons.

Long-Term Prospects

U.S. primary nickel demand will tend to increase; from a 1989 base of 106,140 metric tons, reported consumption is projected to grow 0.6 percent annually to about 110,000 metric tons in 1995. Promising new nickel markets continue to cluster in commercial building construction; environmental control and waste treatment equipment; aerospace components; machinery and equipment for urban and regional transportation systems; processing equipment for petroleum, plastics, and higher quality steel; and machinery for electrical power generation.

Environmental legislation presents an opportunity for development of new markets for high-nickel stainless steel and nickel alloys. These materials are able to withstand the high temperature and corrosive environments of coal-burning utilities, which represent a significant demand potential for nickel in wet scrubbers to reduce sulfur-dioxide emissions. In addition, nickel-based superalloys for aircraft engine components present an opportunity for nickel demand as aging airline fleets approach design life and refurbishment or replacement is required to assure safe performance.

Other than Glenbrook Nickel's possible reopening of the Nickel Mountain mine, no domestic nickel mine production is expected over the next 5 years. Worldwide there are several proposed projects, but only a few expansions will likely occur. Combined Inco's Indonesian and Canadian operations could increase capacity by 22,000 metric tons through 1993. SLN plans to increase its output at its New Caledonia operations by 7,000 metric tons through 1993. Other likely primary nickel plant expansions total about 14,000 metric tons and include Pacific Metals (Japan)—

4,000 metric tons; Niquel Tocantins (Brazil)—5,000 metric tons; and Aneka Tambang (Indonesia)—5,000 metric tons.

No significant shortages of nickel are anticipated over the next 5 years as capacity expansions will tend to oversupply the market, and bring about lower prices. Technical difficulties at any of the major producers could cause some supply tightness, boosting prices temporarily; however, an oversupply and lower prices will be the tendency.—*Graylin W. Presbury, Office of Metals, Minerals, and Commodities, (202) 377-5158, September 1990.*

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TITANIUM

Shipments of titanium mill products increased to an estimated 24,500 metric tons in 1990, down slightly from the record shipments of 24,997 metric tons in 1989. Actual shipments in the first 6 months of 1990 were 5.7 percent ahead of those in the same period in 1989. The categories of sheet, plate, fastener stock, wire, extrusions, pipe and tubing, and other, showed a combined increase of 6.1 percent. The rod and bar category increased by 0.9 percent. Forging and extrusion billets also increased, by 7.2 percent.

Nearly 75 percent of all titanium mill products are used in the manufacture of civilian and military aircraft, with the military accounting for less than half of all mill products used in aerospace. While heavy military use of mill products will continue into the 1990s for military aerospace programs, it is likely that some programs will decline significantly or be stretched out.

The domestic price of titanium sponge metal, the primary form of titanium metal, ranged from $4.75 to $5.50 a pound in 1990, up slightly from 1989 but below the 1981 high of $7.65 a pound. The list price quoted for titanium metal sponge from Japan, the major foreign supplier, was suspended in 1982. However, current Japanese prices are believed to be slightly higher than the U.S. price because of appreciation of the yen in relation to the U.S. dollar.

The three major domestic producers of titanium sponge—TIMET, RMI, and ORMET—increased their production capacities during the 1980s to a combined 29,050 metric tons a year. In addition, several smaller producers added about 4,000 metric tons during 1982-86. However, because of the softness of sponge prices, only the 3 major producers maintained effective domestic sponge capacity. U.S. sponge producers operated close to capacity in 1989 but will drop to 80-85 percent of capacity by 1993.

INTERNATIONAL COMPETITIVENESS

The world's leading producer of titanium sponge is the Soviet Union, with an estimated capacity of 52,000 metric tons. While only small quantities of Russian sponge have been sold on world markets in recent years, increased sales of Soviet sponge are now being reported and additional exports are likely in future years for badly needed foreign exchange. Japanese titanium production is 27,000 metric tons. The United Kingdom's capacity is 5,000 metric tons of titanium granules, while China now has sponge capacity estimated at 2,700 metric tons.

Imports of sponge, which once accounted for a sizable share of U.S. supply, have declined in importance. Their share of consumption during 1954-89 averaged 22 percent, but the import share for 1979-89 was well under 10 percent. In recent years the depreciation of the dollar, particularly in relation to the yen, has resulted in even less reliance upon imports as imported sponge becomes more costly. Imports of sponge in 1990 will account for under 4 percent of domestic consumption.

Japan has been the major supplier of sponge imports to the U.S. during the past 10 years, accounting for 87 percent of imports between 1980 and 1989. The USSR once was the second most important supplier to the United States, but has not been a significant exporter to Western markets since the early 1980s. China was a major supplier to the U.S. in 1980-81 and again in 1988.

Outlook for 1991

The titanium industry will decline slightly in 1991, with a decrease in demand for mill products in both civilian and military aerospace uses, but with a small increase in the industrial sector. Major uses in the non-aerospace sector will continue to be in the general chemical, power condenser, and pulp and paper areas, which will account for nearly 50 percent of industrial uses in 1991. Other non-aerospace use categories expected to grow are navy/marine, water technology, and medical.

Domestic production of sponge in 1991 will remain near the 1990 level of 26,100 metric tons. Even with a steady

Table 12: Net Shipments of Titanium Mill Products and Castings, 1987-89

(in metric tons)

Products	1987	1988	1989	January-June 1989	January-June 1990	Percent Change 1989-90[1]
Mill Products, total net shipments[2]	20,236	22,573	24,997	12,063	12,756	5.7
Forging and extrusion billet	10,980	10,701	11,742	5,082	5,449	7.2
Rod and Bar	2,934	3,530	3,566	1,921	1,938	0.9
Extrusion (other than tubing); pipe and tubing; and other[3]	6,322	8,342	9,689	5,060	5,369	6.1
Castings	431	549	438	167	243	45.5

[1] First 6 months of 1990 compared to first 6 months of 1989.

[2] Net shipments are the sum of mill product shipments plus mill products consumed in the manufacture of fabricated products, less total receipts of mill products.

[3] Fastener stock and wire is combined with the "other" category to avoid disclosing individual company data. Source: U.S. Department of Commerce; International Trade Administration: Bureau of Mines.

SOURCE: U.S. Department of Commerce; Bureau of the Census; International Trade Administration (ITA).

Table 13. Trends and Forecasts: Titanium

(in metric tons except as noted)

Item	1987	1988	1989	1990[1]	1991[2]	1995[3]
Sponge Metal						
Production	17,861	22,285	25,225	26,100	26,000	27,000
Consumption	17,895	21,017	24,927	25,600	25,500	26,000
Imports for consumption	924	1,365	903	1,000	1,000	1,000
Imports as a percent of consumption	5	6	4	4	4	4
Industry stocks (Dec. 31)	2,273	2,441	2,114	2,400	3,000	3,000
Government stocks	33,435	33,435	33,413	33,413	33,413	33,413
Producer price ($1 lb)	4.00-4.20	4.25-4.75	4.75-5.25	4.75-5.50	—	—
Scrap Metal						
Consumption	16,374	18,071	17,956	16,100	16,000	17,500
Stocks	9,182	8,601	8,028	9,200	9,400	9,500
Imports	2,220	4,238	5,308	3,900	3,000	3,500
Exports	5,086	5,993	5,474	6,800	6,000	6,000
Ingot						
Production	33,785	38,882	41,306	37,500	38,200	40,000
Consumption	32,282	35,580	31,396	37,400	37,500	38,000
Stock (Dec. 31)	4,047	3,935	3,548	3,700	4,000	4,500
Mill Products						
Net Shipments	20,231	22,573	24,997	24,500	24,500	25,000
Imports	892	1,059	1,440	1,500	1,500	1,500
Exports	4,270	4,765	6,559	6,800	7,000	7,000

[1] Estimate
[2] Forecast

SOURCES: U.S. Department of Commerce: International Trade Administration (ITA); U.S. Bureau of Mines and estimates and forecasts by ITA.

increase in domestic capacity, the industry will be operating at better than 80 percent of production capacity. Scrap consumption will remain important in 1991, due to the availability of quality scrap at competitive prices. Ferrotitanium scrap prices will also soften, due to abundant supplies.

World capacity for sponge production is increasing and will continue to exceed demand; this trend will exert downward pressure on prices, particularly those of Japanese sponge. Japanese producers, however, will try to increase their exports of both mill products and sponge to the United States. In addition, Russian exports of sponge to world markets will grow as their military needs decline. The General Services Administration currently has 33,413 short tons of sponge in the strategic stockpile; this quantity is not expected to change in the near future.

Long-Term Prospects

The outlook for titanium mill products depends primarily upon demand from the commercial and military aircraft industries, which will account for about 70-75 percent of titanium consumption, through 1995. However, growth in other industrial uses of titanium is expected to become more important over the next 5 years with a growth rate of 5 to 10 percent.

Based on the reported backlog of orders, the demand for titanium mill products for civilian aircraft will show steady but low growth during this period. The air transport industry continues to replace aging aircraft with lighter, more fuel efficient planes. This is particularly important if oil prices should surge. Military demand for titanium will be somewhat weaker during the next 5 years due to cutbacks in overall defense spending. However, titanium will continue to be essential to aerospace programs.

The recent increase in sponge capacity in the United States, Japan, and the United Kingdom insures that users of titanium mill products will have more than adequate supplies of metal for the foreseeable future. Prices of the metal will remain soft, which will help titanium compete with alternate materials, such as advanced composites. The titanium industry will continue to expand the nonaerospace sector of the market place during the next 5 years.—*James J. Manion, Office of Metals, Minerals, and Commodities, (202) 377-5157, September 1990.*

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ZINC

Continued weakness in the transportation and construction sectors resulted in a 7 percent decline in domestic consumption of slab zinc in 1990, settling at 986,000 metric tons. Domestic production, however, increased 3.4 percent to 370,000 metric tons, reflecting low stocks and a slight increase in secondary capacity.

The United States is the world's single largest consumer of zinc, accounting for almost one-quarter of total consumption. In 1990, zinc galvanizing accounted for 53 percent of total domestic consumption followed by zinc die castings, 22 percent; brass and bronze, 11 percent; with the remaining 14 percent going to zinc oxides, rolled zinc, and several other end-uses.

As a result of a downturn in the automotive and construction industries, zinc galvanizing consumption in 1990 decreased almost 6 percent to an estimated 520,000 metric tons. The transportation sector is the single largest consumer of galvanized steel, followed by highway and heavy construction. Electrogalvanizing, a relatively new process, has made

Table 14. Trends and Forecasts: Slab Zinc

(in thousands of metric tons except as noted)

Item	1987	1988	1989	1990[1]	1991[2]	1995[2]
Mine production	216	244	276	560	650	850
Slab zinc production	344	330	358	370	380	390
Year end stocks (producer, (consumer, and merchant)	96	86	91	87	87	—
Consumption	1,052	1,089	1,060	986	969	1,050
Imports for consumption:						
Slab Zinc	706	749	712	624	598	630
% of consumption	67.1	68.8	67.2	63.3	61.7	60.0
Ores and Concentrates	46	63	41	40	40	35
Exports:						
Slab Zinc	1	1	8	8	9	10
Ores and Concentrates	17	34	79	350	440	650
Scrap (zinc content)	88	104	106	110	115	120
U.S. producer price (cents per pound)[3]	41.9	60.2	89.0	77.9	—	—

[1] Estimate.

[2] Forecast.

[3] ***Metals Week*** average

SOURCES: U.S. Department of Commerce, International Trade Administration (ITA); U.S. Bureau of Mines; ***Metals Week***. Estimates and forecasts by ITA.

large gains in the galvanizing market. U.S. steelmakers have added more than 2.5 million tons of electrogalvanizing capacity in the last 3 years, most of which is being used to supply the automotive industry.

Zinc die-casting consumption was flat in 1990, leveling off at an estimated 220,000 metric tons. The transportation sector is the largest end-user of zinc die castings, accounting for around 34 percent of total die casting consumption. Between 1984 and 1987, the average weight of zinc die casting used per car decreased from 21.7 to 19.9 pounds per car, largely because of the growing use of thin-wall die casts and the practice of replacing carburetors with fuel-injection systems that require less zinc. This downward trend was reversed in 1988, as some substitutes were abandoned in favor of zinc die castings. High zinc prices in 1989 and 1990, however, may have resulted in renewed substitution.

Between March 1989 and the first quarter of 1990, the price of slab zinc dropped from a record high of 95 cents per pound to 65 cents per pound. During the remainder of the first half, the price rebounded to 87 cents per pound in response to strong worldwide demand coupled with production problems at smelters in Australia, Canada and Peru, fears of concentrate shortages and start-up problems at Cominco's Red Dog zinc-lead-silver mine in Alaska. In the second half of 1990 the price begin another downward trend, reflecting general weakness in world demand. The average annual producers' price of zinc fell 12.5 percent to 77.9 cents per pound. By the end of 1990 the North American producers' price should no longer be in use, if, as expected, the last domestic producer switches to the London Metal Exchange (LME) based pricing.

Domestic production of slab zinc in 1990 rose 3.4 percent to an estimated 370,000 metric tons—its highest level since 1979. Production during the first half of 1990 was 1.7 percent higher than the same period of 1989 and increased during the second half with additional secondary capacity coming online and all zinc smelters operating at near full capacity. Zinc mine production more than doubled to an estimated 560,000 metric tons as Red Dog began production.

INTERNATIONAL COMPETITIVENESS

Canada, Australia, Peru, and Mexico are the world's largest producers of slab zinc. The United States relies heavily on imports from these and other countries to meet domestic demand. Imports of slab zinc, which accounted for 63.3 percent of consumption, declined about 12.4 percent in 1990 to 624,000 metric tons. The 4 countries mentioned above accounted for about 87 percent of total imports.

The U.S.-Canada Free Trade Agreement went into effect at the beginning of 1989, resulting in a 10 percent annual reduction of the tariff rate on zinc products imported from Canada and the total elimination of the tariff by 1998. During this period, the U.S. government is required to monitor imports of zinc alloy (which has a tariff of 19 percent) from Canada to determine if an increase of Canadian imports has had an adverse effect on U.S. national security interests. Zinc alloy was awarded General System of Preference (GSP) status in 1990, allowing Mexico, Peru and other GSP countries to export zinc alloy to the U.S. duty free.

Outlook for 1991

U.S. demand for zinc is expected to decrease an additional 1.7 percent to 969,000 metric tons in 1991 because of a projected decline in commercial and nonresidential construction offsetting slight growth in the transportation sector. Zinc-based diecasting alloy is the only end-use market expected to experience any growth in 1991, as a result of an increase in automobile production (primarily in foreign transplants).

U.S. production of zinc is expected to rise 2.7 percent to 380,000 metric tons as Zinc Corporation of America continues expanding capacity at its Moraco, PA smelter. Domestic mine production is expected to rise around 16 percent as Red Dog increases its production. Almost all of this production will be exported to Canada or the Pacific Rim. Imports of slab zinc are expected to decline 4.2 percent to 598,000 metric tons in 1991. Canada will continue to be the largest source of foreign slab zinc.

Long-Term Prospects

The zinc industry will experience growth in demand, with consumption rising about 2 percent a year to total 1,050,000 metric tons in 1995. However, that level still will be less than consumption in 1988.

Galvanizing will continue to be the largest end-use sector of zinc. With the automotive industry's increasing demand for electrogalvanized steel sheet, the widespread use of two-sided galvanizing for outer-skin components, and the introduction of electrogalvanizing in other products such as appliances, the market for galvanized steel sheet is projected to grow significantly by the mid-1990s, at the expense of uncoated steel.

The zinc die casting end-use sector should continue to show signs of improvement. Die castings are finding new applications, often replacing plastics because of new alloys and manufacturing techniques that give them improved characteristics at reduced costs. Zinc consumption in both the die casting and brass end-use sectors will continue to be acutely sensitive to the strength of the dollar and imports of semifabricated metal products and finished consumer goods.

Production of slab zinc is expected to increase only slightly, while mine production should increase another 30.8 percent as Red Dog reaches its full capacity.—*David A. Larrabee, Office of Metals Minerals, and Commodities, (202) 377-0575, September 1990.*

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General Components

Shipments by the components industries, measured in 1987 dollars, declined by about 1 percent in 1990 and are projected to decline 0.7 percent in 1991. Exports will continue to grow considerably faster than imports. The trade deficits for the components industries should contract in 1991.

The general components industries include producers of screw machine products (SIC 3451); industrial fasteners (SIC 3452); valves and pipe fittings (SIC 3491, 3494); and ball and roller bearings (SIC 3562).

Before reading this chapter, please see "How to Get the Most Out of This Book" on page 1. It will clarify questions you may have concerning data collection procedures, factors affecting trade data, forecasting methodology, the use of constant dollars, the difference between industry and product data, sources and references, and the Standard Industrial Classification system (SIC). For other topics related to the subject of this chapter, see chapters 1 (Metals and Industrial Minerals Mining); 3 (Crude Petroleum and Natural Gas); 5 (Construction); 8 (Electric Lighting and Wiring Equipment); 10 (Paper and Allied Products); 12 (Chemicals and Allied Products); 13 (Industrial and Agricultural Chemicals); 15 (Metals); 17 (Electronic Components and Superconductors); 18 (Advanced Materials); 19 (Metalworking Equipment); 20 (Industrial Machinery); 21 (Electrical Equipment); 22 (Aerospace); and 37 (Motor Vehicles and Parts).

In 1990, total shipments by the components industry reached $23 billion. Measured in constant dollars, shipments decreased 1.0 percent. Shipments of valves and pipe fittings increased 1.4 percent and screw machine products 0.5 percent, while shipments of industrial fasteners and bearings decreased about 2.0 percent and 5.7 percent respectively.

Favorable dollar exchange rates have contributed to strong export growth. The growth rate of imports has declined as U.S. general components manufacturers have improved competitiveness. Imports from some developing countries did register large percentage increases, although the total value is still relatively low.

The components industries consist of mature companies that are trying to increase their competitiveness by broadening their product lines through acquisitions. As a result, these industries have had large numbers of mergers and acquisitions over the last 3 years.

A small decline in general components shipments is forecast in 1991 due to cutbacks in defense spending and slow growth in the automotive sectors. However, this sector expects a strong demand from commercial aircraft manufacturers and moderate growth in shipments to capital goods markets.

INTERNATIONAL COMPETITIVENESS

Large U.S. general components companies have become very competitive internationally due to significant investments in research and new plant and equipment. Small and medium-sized companies that develop market niches or concentrate on specialty products are also prospering. However, companies that manufacture primarily standard-type or commodity-type general components, and have not made the necessary investments in technology and capital equipment, are experiencing an erosion of their profitability.

SCREW MACHINE PRODUCTS

The value of screw machine products shipments, expressed in constant dollars, increased about 0.5 percent, from $3.10 billion in 1989 to $3.12 billion in 1990. Strong demand from equipment and machinery manufacturers helped offset weak sales in the automotive and appliance sectors. The screw machine products industry also registered increased shipments to commercial aircraft manufacturers. Shipments of screw machine products to the defense industry decreased, as this sector continues to contract.

While it is difficult to give a precise definition of screw machine products, they are custom-designed products of various configurations made on screw machines. The products of this industry are usually manufactured on a job or order basis.

Significant plant and equipment expenditures by the U.S. manufacturing sector were largely responsible for the increased shipments of screw machine products to equipment and machinery manufacturers. Many U.S. plants and factories had been operating at high-capacity utilization rates and are expanding their capacity to meet their needs. As foreign-based companies expand their operations in the United States, many are increasing their purchases of screw machine products from U.S. sources. The exodus of manufacturing facilities and screw machine product customers overseas has slowed considerably.

The automotive industry continues to be the largest customer of the screw machine products industry and a closer working relationship between the two industries is evolving. Auto manufacturers, as part of their efforts to cut costs through inventory control, are asking manufacturers to play a larger role in the planning and supply process for automotive production. These new inventory and purchasing procedures have required major adjustments by screw machine product manufacturers, and the automotive companies have developed training and other assistance programs to help suppliers adapt.

Average total employment in the screw machine products industry in 1990 declined about 2.5 percent to 42,800 workers,

Trends and Forecasts: General Components (SIC 345, 3491, 3494, 3562)

(in millions of dollars except as noted)

Item	1987	1988[1]	1989[2]	1990[2]	1991[3]	Percent Change 1987-88	1988-89	1989-90	1990-91
Industry Data									
Value of shipments[4]	18,587	20,585	22,049	22,933	—	10.7	7.1	4.0	—
3451 Screw machine products	2,806	3,128	3,440	3,612	—	11.5	10.0	5.0	—
3452 Bolts, nuts, & washers	5,084	5,506	5,823	5,979	—	8.3	5.8	2.7	—
349A[5] Valves & pipe fittings	6,973	7,621	8,270	8,858	—	9.3	8.5	7.1	—
3562 Ball & roller bearings	3,724	4,330	4,516	4,484	—	16.3	4.3	−0.7	—
Value of shipments (1987$)	18,587	19,630	19,789	19,583	19,453	5.6	0.8	−1.0	−0.7
3451 Screw machine products	2,806	3,017	3,165	3,182	3,150	7.5	4.9	0.5	−1.0
3452 Bolts, nuts, & washers	5,084	5,320	5,347	5,240	5,135	4.6	0.5	−2.0	−2.0
349A Valves & pipe fittings	6,973	7,210	7,397	7,500	7,538	3.4	2.6	1.4	0.5
3562 Ball & roller bearings	3,724	4,084	3,880	3,660	3,630	9.7	−5.0	−5.7	−0.8
Total employment (000)	203	211	217	214	—	3.9	2.8	−1.4	—
3451 Screw machine products	42.7	43.5	43.9	42.8	—	1.9	0.9	−2.5	—
3452 Bolts, nuts, & washers	52.0	54.4	55.3	53.8	—	4.6	1.7	−2.7	—
349A Valves & pipe fittings	71.3	74.4	77.7	77.5	—	4.3	4.4	−0.3	—
3562 Ball & roller bearings	36.9	39.2	40.2	39.9	—	6.2	2.6	−0.7	—
Production workers (000)	149	157	160	158	—	5.4	1.9	−1.2	—
3451 Screw machine products	34.1	34.6	34.6	33.7	—	1.5	0.0	−2.6	—
3452 Bolts, nuts, & washers	38.7	40.4	41.3	41.0	—	4.4	2.2	−0.7	—
349A Valves & pipe fittings	47.4	50.1	52.1	51.4	—	5.7	4.0	−1.3	—
3562 Ball & roller bearings	29.2	31.6	32.5	32.0	—	8.2	2.8	−1.5	—
Average hourly earnings ($)	10.64	10.84	—	—	—	1.9	—	—	—
3451 Screw machine products	9.14	9.45	9.83	10.23	—	3.4	4.0	4.1	—
3452 Bolts, nuts, & washers	11.02	11.11	11.21	11.61	—	0.8	0.9	3.6	—
349A Valves & pipe fittings	10.63	10.75	10.95	11.06	—	1.1	1.9	1.0	—
3562 Ball & roller bearings	11.99	12.16	12.33	13.20	—	1.4	1.4	7.1	—
Capital expenditures	616	614	—	—	—	−0.6	—	—	—
3451 Screw machine products	100	82	—	—	—	−17.8	—	—	—
3452 Bolts, nuts, & washers	150	152	—	—	—	1.3	—	—	—
349A Valves & pipe fittings	213	186	—	—	—	−12.7	—	—	—
3562 Ball & roller bearings	155	194	—	—	—	25.2	—	—	—
Product Data									
Value of shipments[5]	17,639	19,733	21,152	21,995	—	11.9	7.2	4.0	—
3451 Screw machine products	2,763	3,069	3,380	3,549	—	11.1	10.1	5.0	—
3452 Bolts, nuts, & washers	4,793	5,302	5,617	5,768	—	10.6	5.9	2.7	—
349A Valves & pipe fittings	6,519	7,188	7,800	8,355	—	10.3	8.5	7.1	—
3562 Ball & roller bearings	3,564	4,174	4,355	4,323	—	17.1	4.3	−0.7	—
Value of shipments (1987$)	17,639	18,860	19,009	18,759	18,658	6.9	0.8	−1.3	−0.5
3451 Screw machine products	2,763	2,960	3,104	3,121	3,090	7.1	4.9	0.5	−1.0
3452 Bolts, nuts, & washers	4,793	5,151	5,177	5,073	4,972	7.5	0.5	−2.0	−2.0
349A Valves & pipe fittings	6,519	6,797	6,977	7,027	7,111	4.3	2.6	0.7	1.2
3562 Ball & roller bearings	3,564	3,951	3,751	3,538	3,485	10.9	−5.1	−5.7	−1.5

[1] Advance data from the 1988 Annual Survey of Manufactures.

[2] Estimate.

[3] Forecast.

[4] Value of all products and services sold by establishments in the general components industry.

[5] Includes 3491 and 3494.

[6] Value of products classified in the general components industry produced by all industries.

SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA). Estimates and forecasts by ITA.

of which 33,700 were production employees. The average hourly earnings of production workers increased to about $10.23 in 1990, up 4 percent from 1989.

INTERNATIONAL COMPETITIVENESS

The nonexistence of trade data for screw machine products makes it extremely difficult to project the volume of exports and imports with any accuracy. Favorable dollar exchange rates the last 2 years have improved the competitiveness of U.S. screw machine products, although some U.S. screw machine product companies have lost customers as a result of mergers or acquisitions involving U.S. and foreign manufacturing concerns. However, favorable dollar exchange rates in 1991 would minimize the competition from imports.

Outlook for 1991

Product shipments by the screw machine products industry are projected to decrease about 1.0 percent in 1991. Increased demand from the automotive sector should

U.S. Exports and Imports
General Components

(in millions of dollars except as noted)

SIC	Industry	1989	1990[1]	1991[2]	Percent Change 1989-90	1990-91
3451	Screw machine products					
	Value of exports	—	—	—	—	—
	Value of imports	—	—	—	—	—
3452	Bolts, nuts, rivets, and washers					
	Value of exports	357	582	—	63.0	—
	Value of imports	1,234	1,250	—	1.3	—
349A	Valves & Pipe Fittings					
	Value of exports	1,211	1,514	—	25.0	—
	Value of imports	1,500	1,601	—	6.7	—
3562	Ball and roller bearings					
	Value of exports	474	674	—	42.2	—
	Value of imports	931	857	—	−7.9	—
	General Components					
	Value of exports	2,042	2,770	—	35.7	—
	Value of imports	3,665	3,708	—	1.2	—

[1] Estimate.

[2] Forecast.

SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA). Estimates and forecasts by ITA.

U.S. Trade Patterns in 1989
General Components
SIC 345, 3491, 3494, 3562
(in millions of dollars, percent)

Exports			Imports		
	Value	Share		Value	Share
Canada & Mexico	836	40.9	Canada & Mexico	550	15.0
South America	108	5.3	South America	45.4	1.2
European Community	380	18.6	European Community	654	17.8
East Asia NICs	209	10.2	East Asia NICs	940	25.6
Japan	119	5.8	Japan	1,002	27.3
Other	390	19.1	Other	474	12.9
World Total	2,042	100.0	World Total	3,665	100.0

Top Five Countries

	Value	Share		Value	Share
Canada	541	26.5	Japan	1,002	27.3
Mexico	295	14.4	Taiwan	574	15.7
United Kingdom	172	8.4	West Germany	413	11.3
Japan	119	5.8	Canada	407	11.1
West Germany	111	5.4	Italy	160	4.4

See "How to Get the Most Out of This Book" for definitions of the Country Groupings.
SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA).

follow an anticipated recovery in U.S. production. A large backlog in orders for large commercial aircraft and growing demand for general aviation aircraft should bolster sales of screw-machine products to the aerospace industry, despite decreased demand from the military aircraft sector. Demand from machinery and equipment manufacturers may be mixed in 1991, after strong growth the previous two years. Sales to farm machinery and oil field equipment manufacturers are expected to increase, but sales to other machinery manufacturers, such as producers of machinery for building construction, could decrease. Weak demand from appliance manufacturers and cutbacks in defense spending are expected to be major factors contributing to the overall decline in screw machine product shipments in 1991.

Long-Term Prospects

The long-term outlook for the U.S. screw machine product industry is highly dependent on the growth and competitiveness of the U.S. manufacturing base. Foreign exchange rates will continue to play a major role in the competitiveness and the size of the U.S. manufacturing base. Large increases in imports of machinery and equipment would contribute to an erosion of the U.S. manufacturing base and subsequently lead to lost customers and sales for screw machine products manufacturers. Given the present favorable dollar exchange rates and assuming that high oil prices do not continue for an extended period of time, shipments of screw machine products are projected to grow at an average annual rate of between 2.5 and 3.5 percent through 1995.—*Richard Reise, Office of Capital Goods, Capital Goods and International Construction, (202) 377-3489, October 1990.*

Additional References

(Call the Bureau of the Census at 301-763-4100 for information about how to order Census documents.)

Census of Manufactures, 1987, MC-87-1-34D, Bureau of the Census, U.S. Department of Commerce, Washington, DC 20233. Telephone: (301) 763-7304.

INDUSTRIAL FASTENERS

The constant-dollar value of industry shipments by the industrial fastener industry increased about 0.5 percent in 1990. Sales to commercial aircraft manufacturers and to some equipment and machinery producers increased significantly. Exports registered considerable strength with an increase of over 60 percent compared to 1989 levels. Depressed demand from the automotive sector and a weak construction industry were major reasons for the leveling off of total industrial fastener shipments. Cutbacks in defense spending also had a negative impact on the industrial fastener industry. The automotive sector is the largest consumer of industrial fasteners, accounting for 25 to 30 percent of fastener production.

Rapid changes in manufacturing technology pose many challenges for the U.S. industrial fastener industry. Technological advances in fastener-making machine tools are improving production, efficiency, and product quality and are hastening the development and introduction of new products. The coldforming process is an expanding technology in the fastener industry due to the increased flexibility it offers industrial fastener producers.

The increased use of plastics and composites in fasteners, especially by automotive manufacturers, is another challenge facing fastener companies. Some advantages of plastic fasteners are lighter weight and resistance to corrosion. Plastic fasteners are also suitable for applications involving exposure to chemicals. They are already being used in a variety of applications formerly held by metals. The use of plastic fasteners is expected to expand as technology and manufacturing methods advance.

INTERNATIONAL COMPETITIVENESS

U.S. exports of industrial fasteners totaled $582 million in 1990 compared to $357 million in 1989. The large increase in exports of industrial fasteners was due to a combination of factors. The industry has benefited from favorable dollar exchange rates the last two or three years, which has strengthened the international competitiveness of U.S. fastener manufacturers. U.S. manufacturers are taking advantage of the reduced Canadian tariffs resulting from the U.S.-Canada Free Trade Agreement. Canada continues as the largest foreign market for U.S. industrial fasteners, accounting for 57 percent of U.S. exports.

U.S. manufacturers are also benefiting from strong demand from the European after-market as a result of increased exports of U.S.-made machinery and equipment to Europe. When U.S. capital equipment is repaired or maintained, fasteners from original suppliers are preferred. U.S.-based manufacturers with plants in Europe are buying more fasteners from the United States. The European Community (EC) countries bought 14 percent of the industrial fasteners exported from the United States in 1990. Mexico, with an 11-percent share, remained second among countries purchasing U.S. industrial fasteners. Particularly strong growth was registered for fastener exports to Japan, South Korea, and Singapore.

Imports of industrial fasteners registered a small 1 percent increase in 1990. Japan and Taiwan remain the 2 largest suppliers to the U.S. market with 30 and 28 percent shares respectively, but the value of imports from both countries declined. Imports are comprised mostly of "standards" (multipurpose products) and the weakness of the U.S. automotive and construction industries, which are large consumers of these products, was a major factor in the small increase in imports. The U.S. trade deficit in industrial fasteners declined about $200 million in 1990 to $668 million.

Mergers and acquisitions continue to influence the U.S. industrial fastener industry. Textron and Banner Industries are still assimilating their major acquisitions of fastener lines. Illinois Tool Works' (ITW) acquisition of Buell Industries is the most recent consolidation of fastener manufacturers. ITW's objective was to broaden its line of fasteners at a time when customers are reducing their number of suppliers. ITW produced a line of fasteners with small diameters compared with the large-diameter fasteners manufactured by Buell. The acquisitions have allowed the purchasers to expand their product lines and to become more competitive in international markets.

The proposed Fastener Quality Act that addresses the issue of mismarked, substandard, or counterfeit fasteners in the U.S. market is under consideration by the U.S. Congress. The bill would mandate certain testing and certification procedures to assure the quality of high-grade fasteners. A number of programs have already been implemented by major equipment manufacturers and government procurement agencies to assure the quality of the fasteners in their supply systems.

Outlook for 1991

Industry shipments by industrial fastener manufacturers are expected to decline about 2 percent in 1991. Cutbacks in defense spending and a weak construction sector are major factors for the projected decline. Expected increased production by the automotive sector would help many fastener companies that are highly dependent on that sector, which is the largest consumer of industrial fasteners. Strong demand for aircraft fasteners from commercial aircraft manufacturers will be partially offset by decreased consumption by the military aircraft segment of the aerospace industry. Strong demand is also expected from various machinery and equipment manufacturers in 1991. Increased sales are expected to the farm machinery, road construction equipment, machine tools, and paper machinery sectors. Sales to oilfield equipment manufacturers and oil drilling companies should also improve, given the recent increase in oil prices.

Exports of industrial fasteners should continue to expand in 1991 but the rate of growth is projected to slow to 15 percent as the value of exports increases to about $670 million in 1991. An increase in the level of exports is dependent on favorable dollar exchange rates and an expansion in the world economy. Canada and Mexico should continue to be good export markets, and Europe should be a good export market for strong U.S. fastener companies. The recent strengthening of some U.S. fastener companies through mergers, acquisitions, and joint ventures should put them in a better position to compete in export markets.

Little or no growth is expected in U.S. imports of industrial fasteners. Japan and Taiwan will remain the largest suppliers of industrial fasteners, but their shares should shrink as developing countries start to make inroads on the U.S. market. Eastern European countries are also trying to increase their shares of the U.S. market.

Long-Term Prospects

Shipments by the industrial fasteners industry are expected to increase at an average annual rate of 1 to 2 percent through 1995. Cutbacks in defense spending will be the major factor contributing to the projected slow growth. A large backlog in orders for commercial aircraft should assure increased demand for aircraft fasteners, despite a cutback in military aircraft production. Demand from the construction industry should improve as that sector recovers from its doldrums. Limited increases in demand from the U.S. automotive sector should lead to increased competition among the remaining fastener suppliers to that sector. The fastener industry should benefit from the aging of the U.S. infrastructure. Badly needed repairs for U.S. highways and bridges would require a good number of fasteners. Provided funding is available, this should be a growth area for industrial fastener shipments during the next five years.

Exports should also be a growth area in the next five years. With the decreased emphasis on defense spending by the industrialized countries, more resources will be devoted to rebuilding the economies of Eastern Europe and the expansion of developing countries. U.S. exporters of industrial fasteners see Eastern Europe as a real growth area. The phasing out of tariffs between the United States and Canada should encourage increased trade of fasteners between the two countries. Increased requirements for greater part sophistication, smaller lot sizes, and more demanding quality standards will require changes by fastener manufacturers, if they are to remain competitive in markets that are becoming more international in scope.—*Richard Reise, Office of Capital Goods, Capital Goods and International Construction (202) 377-3489, October 1990.*

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(Call the Bureau of the Census at (301) 763-4100 for information about how to order Census documents.)

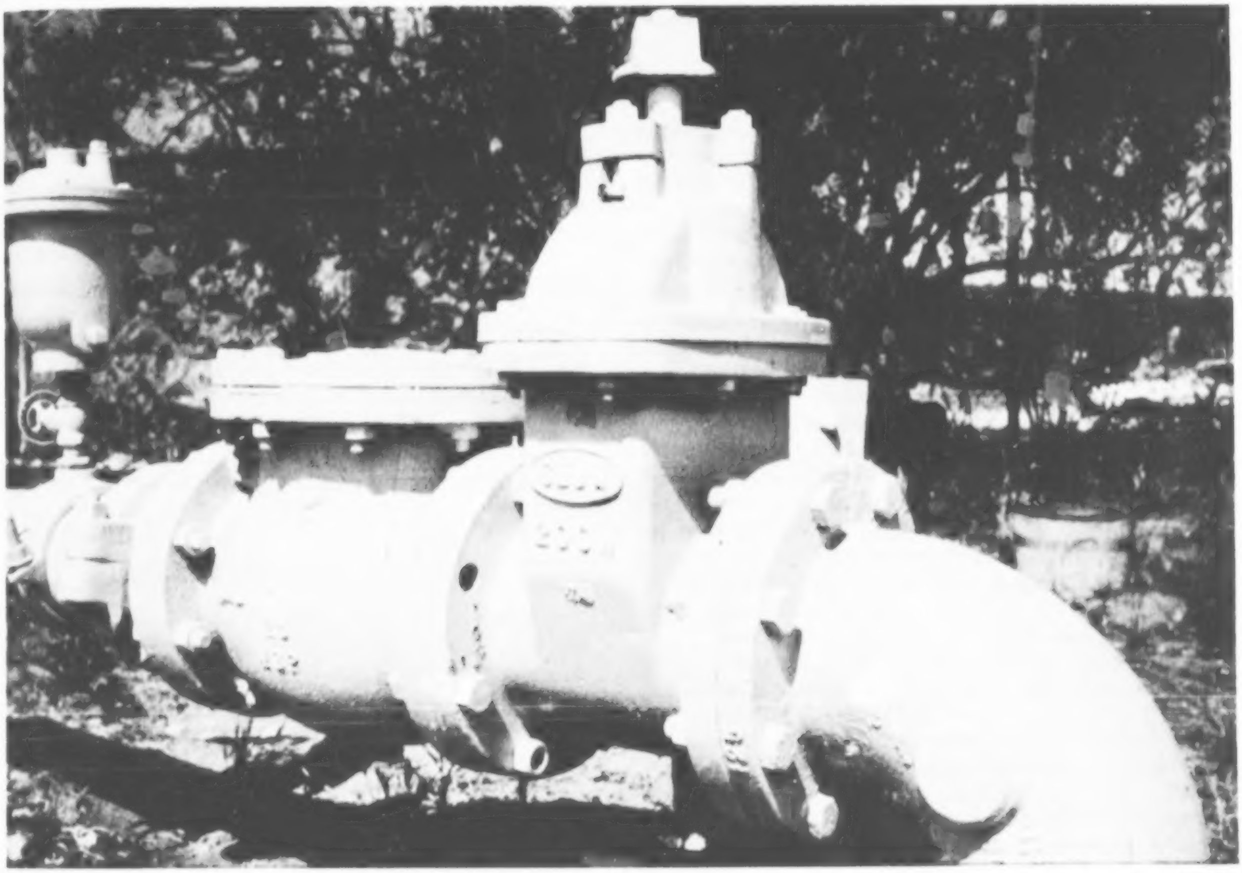
Census of Manufactures, 1987, MC-87-1-34D, Bureau of the Census, U.S. Department of Commerce, Washington, DC 20233. Telephone: (301) 763-7304.

Fastener Technology International, Initial Publications, Inc., 3869 Darrow Road, Suite 101, Stow, OH 44224. Telephone: (216) 686-9544.

VALVES AND PIPE FITTINGS

The value of industry shipments for the valves and pipe fittings industry, expressed in constant-dollar terms, increased about 1.4 percent in 1990. Increased sales to the manufacturing sector, particularly the chemical and pulp and paper industries, was a major factor contributing to the increase. The strong demand from the manufacturing sector is due to the critical need for expanded facilities as a result of the high-capacity utilization rates of a number of manufacturing industries. The water and sewer construction sector was also a growth sector for valve and pipe fitting manufacturers in 1990. Demand from oil-related industries also increased, particularly since the crisis in the Middle East. Reduced sales to the residential and commercial construction sectors partially offset increases to the other sectors. Total employment in the valve and pipe fittings industry decreased from 77.7 million in 1989 to 77.5 million in 1990; of this number 66 percent are production workers. Average hourly earnings rose 1.0 percent, from 10.95 in 1989 to 11.06 percent in 1990.

The increased emphasis on environmental and safety and health issues is having a significant impact on U.S. value and pipe fitting manufacturers. The concern over the quality of



B. Rockwell Nordstrom

Demand is strong for U.S. valve-and pipe-fittings, with an average annual increase of 2-to-3 percent expected through 1995.

drinking water has led to decreased use of lead, zinc, and cadmium in valves and pipe fittings used in water systems.

The greater use of higher temperatures, higher pressures, and corrosive materials in manufacturing processes has led to the need for improved valve and pipe fitting products. The use of nickel alloys and fluorocarbons has increased significantly. Also value and pipe fitting manufacturers are making more use of different coatings.

INTERNATIONAL COMPETITIVENESS

Strong foreign demand also helped U.S. valve and pipe fitting manufacturers as exports increased about 25 percent. Exports of valves and pipe fittings to Canada registered the largest increase, but some of the increase could be attributable to underreporting of exports by U.S. exporters in 1989. Canadian statistics for imports from the United States are now being used to estimate U.S. exports to Canada. Canada was the destination for 37 percent of U.S. exports of valves and pipe fittings in 1990. Mexico remains the second largest market, with a 12 percent share. Exports to European Community (EC) countries registered strong gains with increases of over 20 percent to West Germany, Belgium, Italy, and the Netherlands. Exports of steel valves increased but exports of control valves declined significantly.

The rate of growth for imports of valves and pipe fittings continued to decline in 1990, increasing by only 7 percent. Imports of pipe fittings actually declined slightly. Germany and Japan were the two largest suppliers of valves and pipe fittings to the U.S. market, both with 16 percent shares. Several countries registered significant increases in their shares of the U.S. market. Valve imports from Mexico increased over 30 percent and imports of fittings from China doubled in value.

Outlook for 1991

Total industry shipments of valves and pipe fittings, measured in constant dollars, may register a 0.5 percent increase in 1991. Strong demand is expected from the oil-related industries, pulp and paper manufacturers, and the chemicals sector. Increased sales to the construction after-market are also likely. Reduced sales to the residential and commercial construction sector will be the major factor depressing the demand for valves and pipe fittings in 1991. Sustained high oil prices would drastically alter the outlook for the industry. Suppliers catering primarily to the energy-related industries would do a brisk business, but other valve and pipe fittings manufacturers could suffer a sharp cutback in the demand for their products.

Many parts of the country are badly in need of expanded or improved water and sewer facilities but budget problems for the state and local governments could mean limited funds for such projects and suppress the demand for valves and pipe fittings. Lack of investment funds allocated to power generation expansion will adversely impact manufacturers supplying that industry sector.

Foreign demand for U.S. valves is expected to increase about 10 percent in 1991. Canada will remain the most important export market, but exports to Europe are also expected to rise. Exports to large oil-producing countries should show strong growth as countries seek to expand their oil production capabilities. Mexican markets should also be a growth area for valves and pipe fittings.

Many valve and pipe fittings companies that cater to certain market niches or concentrate on specialty products will continue to enjoy success in international markets, because they have little or no competition, and have large, untapped markets they can target. U.S. manufacturers also have an advantage in selling valves and pipe fittings for use in high-technology or critical applications since they have access to advanced valve technology and can more readily develop or adapt products to meet the changing needs of various industries.

Imports of valves and pipe fittings are expected to show little or no growth in 1991. However, individual developing countries can be expected to expand their shipments of commodity-type valves or pipe fittings to the United States. Lower labor costs give these countries a considerable cost advantage over U.S. producers, but U.S. tariffs hurt the price competitiveness in U.S. markets. Countries that are granted the General System of Preferences (GSP) treatment receive zero percent tariffs on their products and gain an advantage over other foreign suppliers to the United States market. The growth of valve and pipe fittings imports from South Korea and Taiwan slowed considerably after the two countries graduated from the GSP program.

Long-Term Prospects

The long-term prospects for the U.S. valve and pipe fittings industry are favorable. Industry shipments are projected to show an average annual increase of 2-to-3 percent through 1995. Strong demand from such major valve and pipe fittings consumers as the energy-related industries, pulp and paper companies, and chemical manufacturers should compensate for slow growth in demand from the construction industry.

Exports should also be a growth area for U.S. valves and pipe fittings. The Soviet Union and countries of Eastern Europe are good potential export markets since Western technology can help solve many problems facing their production facilities and distribution systems. However, penetrating these markets will take time and energy, and a lack of hard currencies will require unique solutions for payments and financing.

The elimination of trade barriers offers great potential for U.S. valve and pipe fittings manufacturers during the next 5 years. Ratification of a Uruguay Round of the General Agreement on Tariffs and Trade (GATT) accord would open up foreign markets. The reduction of tariffs and other trade barriers by South American countries has already created opportunities for sales of U.S.-produced valves and pipe fittings. A possible Free Trade Agreement with Mexico would also stimulate U.S. exports of valves and pipe fittings. However, bilateral trade agreements would probably reduce U.S. tariffs on valves and pipe fittings. To meet the increased challenge posed by imports that would result from lower U.S. tariffs, U.S. manufacturers must be willing to adapt and concentrate on products they have a competitive advantage in producing. A valve and pipe fittings industry that develops new products and technology, partially in response to environmental concerns, will have an advantage over competitors.—*Richard Reise, Office of Capital Goods, Capital Goods and International Construction, (202) 377-3489, October 1990.*

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Valve Magazine, Valve Manufacturers Association of America, Suite 700, 1050 17th Street, N.W., Washington, DC 20036. Telephone: (202) 331-8105.

BALL AND ROLLER BEARINGS

In 1990, industry shipments of ball and roller bearings, measured in 1987 dollars, decreased about 5.7 percent. The decline was largely attributable to depressed demand from the automotive sector that is the most important consuming industry for bearing manufacturers. Demand from other sectors such as outboard motors and heavy durables also weakened. The cutback in the defense industry also had a negative impact, although developments in the Middle East led to increased orders for some bearing products. Shipments to some machinery and equipment sectors, such as farm machinery and construction machinery, did register increases. Total employment for the industry reflected the downturn in shipments, declining about 0.2 percent. The average number of production workers employed by the industry declined 1.5 percent.

Merger and acquisition activity continued as major bearing companies try to broaden their product lines and increase their competitiveness in U.S. and international markets. The Timken Company of Canton, Ohio, the world's largest manufacturer of tapered roller bearings, acquired MPB Corporation, a manufacturer of miniature precision ball bearings. The acquisition extends Timken's product lines into ball bearings, a new product area for them. Tsubakimoto Precision Products Company, a Japan-based bearing manufacturer acquired the Ball Products Division of Hoover Group, a major manufacturer of precision miniature balls in the United States. A Germany-based manufacturer of bearings, FAG Kugelfischer, made a bid for The Barden Corporation, a Connecticut-based manufacturer of precision bearings.

INTERNATIONAL COMPETITIVENESS

Exports of bearings registered a strong gain in 1990. Favorable dollar exchange rates contributed significantly to the increased competitiveness of U.S. bearing products on international markets. Canada remained the largest foreign market for U.S.-made bearings, with a 40 percent share. Exports to Germany, the second largest market, increased over 30 percent to $65 million, while exports to Mexico declined 11 percent to $43 million.

The value of imported bearings decreased about 8 percent in 1990 to about $857 million. In addition to favorable dollar exchange rates making U.S. bearings more competitive, actions by the Federal government have also affected the level of imports. The Department of Defense Federal Acquisition Regulations requiring U.S.-made bearings in their contract purchases has adversely influenced imports. Also, the penalties imposed on imports from some countries as a result of bearing dumping investigations have hurt import levels.

Japan's share of the U.S. bearing import market remained the largest at 39 percent. Imports from Canada, the second largest supplier, declined 20 percent. Imports from three Pacific Rim countries, Singapore, Thailand, and Taiwan, registered increases of 70 percent, 45 percent and 60 percent respectively.

Outlook for 1991

The value of industry shipments by the ball and roller bearing industry, expressed in constant dollars, is expected to decline about 1.8 percent in 1991. Increased shipments are projected for the commercial aircraft sector and some equipment and machinery manufacturers, such as producers of construction and farm machinery. Only a slight improvement in demand is expected from the automotive industry. Bearing suppliers to oilfield equipment manufacturers will benefit from the increased activity in that sector. Cutbacks in defense spending will be the major factor contributing to decreased total shipments of bearings in 1991. Decreased sales to the general industrial machinery and mining machinery sectors will also reduce shipments.

Given the improved competitiveness of U.S. bearings, U.S. exports can be expected to increase by at least 10 percent in 1991. A slowdown in the world economy precipitated by higher oil prices could limit the increase. Canada, Western Europe, and Mexico will continue to be major markets, and exports to the Pacific Rim countries should also register healthy increases.

Imports should continue to decline in 1991, largely due to the expansion of U.S. bearing operations by foreign-based bearing companies. As a result of acquisitions and the expansion of facilities, foreign-based companies will be supplying more of their U.S. customers from plants in the United States. Dumping penalties are another reason U.S. manufacturers will buy fewer imported bearings.

Long-Term Prospects

Industry shipments of ball and roller bearings are forecast to increase between 2 and 3 percent through 1995. Slow expansion in the automotive sector and only moderate expansion in most capital goods markets will keep growth at modest levels. Exports should be a strong growth area with new potential markets developing in Eastern Europe and Mexico.

The strong expansion of the remaining U.S. manufacturing base in recent years has made U.S.-manufactured goods more competitive in domestic and international markets and assured the bearing industry a strong customer base. Strong domestic markets are vital to the survival of U.S. bearing companies. U.S.-made bearings must still compete against imported bearings but at the present they appear to be in a good position to do so. Despite decreased total sales of bearings in 1990 and a projected decline in 1991 profit margins are healthy, which should allow U.S. bearing companies to make the necessary investments in research/development and plant/equipment to remain competitive.

Competition among bearing companies will intensify as the globalization of the bearing industry continues. Should profit margins erode again, U.S. bearing companies could find themselves fighting for survival. Government support activities such as dumping duties and the Department of Defense acquisition regulations are important to the future health of this U.S. industry.—*Richard Reise, Office of Capital Goods, Capital Goods and International Construction, (202) 377-3489, October 1990.*

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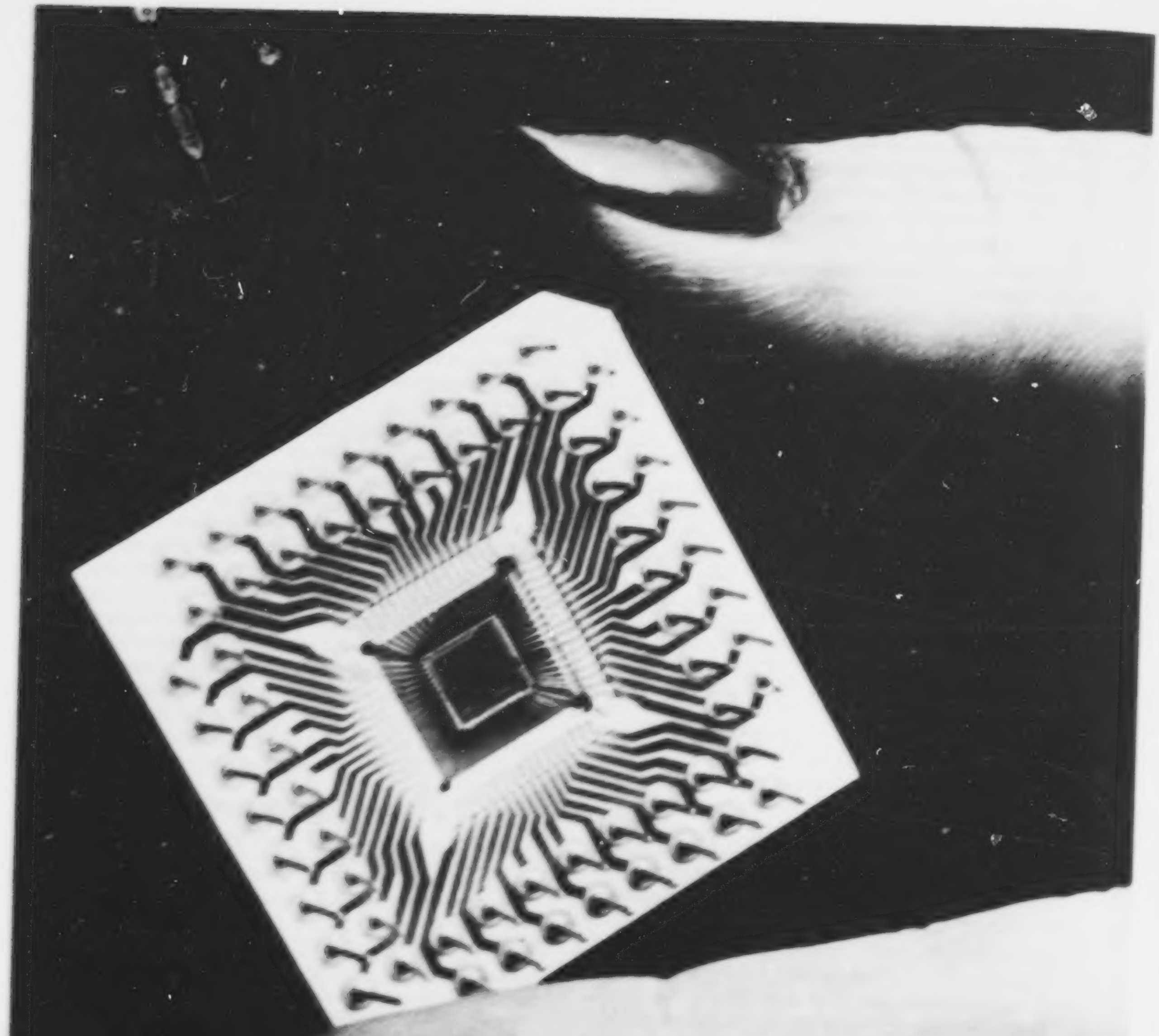

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Electronic Components and Equipment

The electronic components industry (SIC 367) experienced sluggish growth in 1990 with current dollar product shipments increasing 1.3 percent over 1989 levels. Slackening demand for components by domestic computer and telecommunications companies was partially offset by increased exports. Shipment levels for semiconductor manufacturing equipment for 1990 were flat.

ELECTRONIC COMPONENTS

The term "electronic component" is used to describe a wide array of products, ranging from the simplest coil to the most sophisticated integrated circuit. An enormous amount of human and financial capital is invested every year by companies competing to develop smaller, faster, more reliable, and more complex components. These advances fuel the developments in the computer, telecommunications, aerospace, robotics, and other related industries.

Before reading this chapter, please see "How to Get the Most Out of This Book" on page 1. It will clarify questions you may have concerning data collection procedures, factors affecting trade data, forecasting methodology, the use of constant dollars, the difference between industry and product data, sources and references, and the Standard Industrial Classification system (SIC). For other topics related to the subject of this chapter, see chapters 18 (Advanced Materials), 24 (Industrial and Analytical Instruments), 28 (Computer Equipment and Software), and 30 (Telephone and Telegraph Equipment).

The sluggish overall growth of the domestic economy has weakened demand for components while overcapacity has placed downward pressure on prices. Producers, therefore, have cut costs sharply in order to stay profitable while maintaining market share. The uncertain business conditions also have led to further consolidation within the industry, with a number of U.S. companies divesting themselves of component operations.

Semiconductor producers continue to forge ahead in the design and production of new generations of memory circuits. Mixed analog-digital ASICs (application specific integrated circuits) are finding increased use in the automotive, consumer, and communications equipment markets. Constant improvement in materials, production processes, and quality controls has allowed capacitor, resistor, and connector manufacturers to produce high quality, low defect-rate components for use in just-in-time delivery arrangements.

Outlook for 1991

Current-dollar shipments of electronic components are anticipated to increase 6.6 percent in 1991, with semiconductor shipments experiencing a rise of 9.0 percent. European and Asian sales are expected to outperform the domestic market. This trend, when coupled with a weak dollar, will help expand U.S. exports.

Semiconductor producers will continue to develop integrated chip sets that provide complete system functions. This upstream move in the product development chain will necessitate close interaction between chip producers and users. The move to surface mount technology (SMT) will continue in the passive component sector, with more companies investing in SMT design and production equipment. Component producers will compete for sales on the basis of "cost of ownership" to their buyers, which includes price, inventory, testing costs, and defect rates.

Trends and Forecasts: Electronic Components and Accessories (SIC 367)

(in millions of dollars except as noted)

Item	1987	1988[1]	1989[2]	1990[2]	1991[3]	Percent Change 1987–88	1988–89	1989–90	1990–91
Industry Data									
Value of shipments[4]	50,256	57,981	61,806	62,610	66,734	15.4	6.6	1.3	6.6
Value of shipments (1987$)	50,256	57,175	60,985	62,079	65,888	13.8	6.7	1.8	6.2
Total employment (000)	547	561	533	520	506	2.6	−5.0	−2.4	−2.7
Production workers (000)	330	343	333	327	320	3.9	−2.9	−1.8	−2.1
Average hourly earnings ($)	9.32	9.99	—	—	—	7.2	—	—	—
Product Data									
Value of shipments[5]	46,710	53,624	56,658	57,489	60,825	14.8	5.6	1.5	5.8
Value of shipments (1987$)	46,710	52,223	55,715	55,148	57,227	11.8	6.7	−1.0	3.8

[1] Advance data from the 1988 Annual Survey of Manufactures.

[2] Estimate.

[3] Forecast.

[4] Value of all products and services sold by establishments in the electronic components and accessories industry.

[5] Value of products classified in the electronic components and accessories industry produced by all industries.

SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA). Estimates and forecasts by ITA.

U.S. Trade Patterns in 1989
Electronic Components and Accessories
SIC 367
(in millions of dollars, percent)

Exports	Value	Share	Imports	Value	Share
Canada & Mexico	2,989	22.3	Canada & Mexico	2,742	15.5
South America	270	2.0	South America	37.4	0.2
European Community	1,925	14.3	European Community	984	5.6
East Asia NICs	5,158	38.5	East Asia NICs	7,083	40.0
Japan	1,211	9.0	Japan	5,707	32.2
Other	1,863	13.9	Other	1,168	6.6
World Total	13,416	100.0	World Total	17,722	100.0
Top Five Countries					
	Value	Share		Value	Share
Canada	1,782	13.3	Japan	5,707	32.2
Malaysia	1,383	10.3	South Korea	2,020	11.4
Japan	1,211	9.0	Malaysia	1,788	10.1
Mexico	1,207	9.0	Mexico	1,428	8.1
Singapore	1,038	7.7	Canada	1,314	7.4

See "How to Get the Most Out of This Book" for definitions of the Country Groupings.
SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA).

Long-Term Prospects

Component industry shipments are forecast to grow at an annual rate of 6 to 8 percent through the mid-1990s. U.S. semiconductor manufacturers will have to generate or access enormous capital pools to fund the continuous R&D and capital investment needed to remain competitive. Semiconductor manufacturers that are not part of large, vertically integrated companies will have to form alliances with competitors and customers in order to survive. Consolidation of the passive components industries is expected to continue, with the rate of acquisitions and mergers in the connector and capacitor sectors accelerating.

The continued development of the Pacific Rim region will provide growing sales for U.S. producers. The European Community will remain the primary overseas market, with U.S. suppliers increasing local production capacity and seeking distribution channels into Eastern European markets.—*Robert Scott, Office of Microelectronics and Instrumentation, (202) 377-2795, October 1990.*

SEMICONDUCTORS AND RELATED DEVICES

The U.S. semiconductor industry (SIC 3674) faced a market downturn in 1990, with the value of shipments declining 1.1 percent from 1989 levels. Price erosion took place in most product sectors, with memory chip prices falling by approximately 20 percent. Shipments growth for 1991 is anticipated at 9.0 percent.

Key semiconductor end-user markets such as computers, communications equipment, and instruments are all experiencing sluggish growth. The current Mideast tensions have only added to the business uncertainties and semiconductor purchasers have scaled back orders, particularly original equipment manufacturers (OEMs). The semiconductor book-to-bill ratio declined below 1.0 in the second half of 1990, indicating that new order levels were lagging. The semiconductor industry also was hit by a number of major layoffs and corporate restructurings in 1990. Unemployment in Santa Clara's Silicon Valley has increased steadily in the past 18 months, although it has not approached the levels of the mid-1970s and early 1980s, when the electronics industry was in a recession.

Many semiconductor producers became embroiled in patent infringement suits involving both domestic and foreign competitors. One U.S. semiconductor company has extracted an estimated $600 million from patent licensees since 1986 by aggressive patent enforcement. The question of proprietary rights was highlighted by the U.S. Patent Office's award of a patent for the single-chip integrated circuit (IC) computer architecture. If upheld, the patent will cover many of the semiconductor industry's most important chips and could entitle the inventor to future royalties.

The National Advisory Committee on Semiconductors (NACS), established by Congress in 1988, issued a series of reports warning that the U.S. semiconductor industry was falling behind its foreign competitors because of insufficient investment. The NACS reports stated that the Japanese semiconductor industry had outspent its U.S. counterparts by $12 billion in 1984–90. The reports also called for federal grants and loan guarantees as well as R&D tax credits and changes in semiconductor equipment depreciation rules. A shortening of the current five-year depreciation schedule for semiconductor manufacturing equipment was cited as the single most important incentive to encourage domestic producers to invest in more state-of-the-art equipment.

Product Development

Semiconductors are classified in two product groups, discrete devices and integrated circuits (ICs). Discrete devices, such as transistors and diodes perform a single function, are not as complex as ICs and account for approximately 30 percent of domestic semiconductor industry shipments. ICs are by definition composed of two or more devices and come in a wide variety of forms, functions, and sizes. One major U.S. producer has over 50,000 IC types listed in its product catalog.

All ICs must, however, fall into three broad categories: memory, logic, and logic and memory (microprocessors). Memory circuits store and give back data, while logic circuits perform specified operations on incoming data, such as addition and multiplication. Microprocessors, which form the heart of electronic systems, combine logic and memory functions on one chip.

The fastest growing and yet most volatile segment of the semiconductor market continues to be memory devices. The five largest semiconductor manufacturers relied on the memory market for an average of 30 percent of sales. While memories traditionally have been considered the "cash cows" of semiconductors, recent severe price erosion and global overcapacity have injected uncertainty in this market.

Several U.S. producers have announced their exit from the static random access memory (SRAM) market, citing uncertain business conditions and increased foreign competition. U.S. producers of erasable programmable read-only memories (EPROMs) are currently matching their Japanese competitors, with each nation controlling approximately 35 percent of the market. Japanese producers continue to dominate the dynamic random access memory (DRAM) market. Currently, only three domestic merchant semiconductor companies are producing these devices. DRAMs are currently shifting from 1 Megabit (1M) to 4 Megabit (4M) production, with 1M DRAM prices averaging $6 and 4M DRAMs averaging $34.

Shipments of DRAMs are driven primarily by personal computers (PCs), workstations, and associated peripherals, which accounted for nearly 60 percent of 1990 sales. The increased memory requirements of sophisticated software packages, the surge in networking and associated data buffers, and substantial aftermarket motherboard and add-in module sales are accelerating consumption of DRAMs. The market for 1M DRAMs probably will expand until 1992, when 4M chips will have reached the necessary price levels to supplant the previous generation of chips.

New generations of DRAMs will follow quickly, with one U.S. captive producer anticipating the development of 64M chips in the mid-1990s. DRAMs and SRAMs continue to be the "technology drivers" in the semiconductor industry. The need for faster and denser memories has pushed engineers constantly to improve semiconductor process technology. These advances tend to move in cyclical patterns as innovations incorporated into memory chips spur developments in microprocessors, which in turn require superior performance from memory and logic chips.

Standard logic ICs have seen a lot of their functions transferred directly into microprocessors. The largest growth area for logic is now in ASICs, which provide a custom or semi-custom variation of circuits designed for a specific application to the buyer.

U.S. producers continue to dominate the microprocessor segment, accounting for approximately 65 percent of the world market. Microprocessor technologies are gravitating toward reduced instruction computing. The dominant current technology is known as complex-instruction-set computing (CISC) and relies on several hundred instructions to process information. New reduced-instruction-set (RISC) and minimum-instruction-set (MISC) microprocessors, which increase computing speed by stripping away instructions, are also entering the market.

Automotive electronics represents a growing market, with the average semiconductor content per vehicle expected to increase from $112 in 1990 to $126 by 1994. Semiconductor manufacturers are adapting existing products and developing new ones to operate in engine control, safety, and driver information systems. Semiconductor applications are not limited to the automobile itself, but are found in emerging vehicle navigation and "intelligent" highway technologies.

Sematech

The fastest growing and yet most volatile segment of the semiconductor market continues to be memory devices, such as this 5-inch 64K static random access memory (SRAM) silicon wafer.

Another growing market is for new generations of chips designed to compress the huge amount of data in digitized images and motion video into compact data streams. This trend toward producing chip sets for specific applications has spread throughout the semiconductor industry. Semiconductor designers are now becoming involved in the system level, rather than focusing exclusively on individual pieces. This move upstream means that closer interaction between semiconductor and systems producers is becoming key to the success of both industries.

The cost of developing and manufacturing new ICs has more than doubled with each succeeding generation. Companies can expect to spend from $200 million to $1 billion just to begin producing samples of a chip which will

Trends and Forecasts: Semiconductors and Related Devices (SIC 3674)

(in millions of dollars except as noted)

Item	1987	1988[1]	1989[2]	1990[2]	1991[3]	Percent Change 1987-88	1988-89	1989-90	1990-91
Industry Data									
Value of shipments[4]	19,796	22,486	25,189	24,905	27,135	13.6	12.0	−1.1	9.0
Value of shipments (1987$)	19,796	22,467	25,367	25,570	27,859	13.5	12.9	0.8	9.0
Total employment (000)	185	177	175	171	166	−4.3	−1.1	−2.3	−2.9
Production workers (000)	87.4	85.0	80.8	81.6	81.4	−2.7	−4.9	1.0	−0.2
Average hourly earnings ($)	10.57	11.35	12.15	13.00	—	7.4	7.0	7.0	—
Product Data									
Value of shipments[5]	17,929	20,185	22,410	21,962	23,719	12.6	11.0	−2.0	8.0
Value of shipments (1987$)	17,929	19,578	22,210	20,837	21,582	9.2	13.4	−6.2	3.6

[1] Advance data from the 1988 Annual Survey of Manufactures.

[2] Estimate.

[3] Forecast.

[4] Value of all products and services sold by establishments in the semiconductors and related devices industry.

[5] Value of products classified in the semiconductors and related devices industry produced by all industries.

SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA). Estimates and forecasts by ITA.

become obsolete in three to four years. Faced with these high costs and rapid changes, companies are in a constant search for methods to increase production efficiencies while remaining on the leading edge in the development of smaller, faster, and more complex chips. Semiconductor companies recoup their development costs through the high initial prices of new ICs. Companies that lag in bringing the new products to market often encounter rapid price declines and are unable to remain profitable.

The cost associated with product development in the semiconductor industry also has led to an increased interest in collaborative research. Consortia such as SEMATECH, the Microelectronics and Computer Technology Corporation (MCC), Semiconductor Research Corporation (SRC), and the aborted U.S. Memories were intended to stretch research dollars and strengthen domestic producers. While SEMATECH, SRC, and MCC are active in semiconductor production equipment, basic semiconductor research and information technologies respectively, U.S. Memories failed to generate enough interest from domestic companies to get started.

The advantage provided by size and ready availability of capital are underscored by the gradual move toward product standardization. End-users in the computer and telecommunications sector are asking for increased networking opportunities between systems. This pressure for open systems and standard products provides an advantage to large companies with mass production capabilities. Small innovative companies are still able to hold profitable niche markets, but may eventually be supplanted by their large competitors as the products' market size increases.

INTERNATIONAL COMPETITIVENESS

The U.S. trade deficit in semiconductors dropped from $2.5 billion in 1989 to an estimated $1.5 billion in 1990. U.S. exports grew 9.7 percent in 1990 while imports fell approximately 2 percent (based on value). Exports to East Asian countries other than Japan and to the European Community (EC) led the growth, while exports to Japan increased slightly. The EC represents the third largest regional semiconductor market, accounting for 18 percent of worldwide semiconductor consumption, with Japan consuming 40 percent, and the U.S. 32 percent.

The 14 percent loss in total value of imports from Japan, shown in Table 1, is due in large part to a significant drop in value for three categories of semiconductor imports from Japan: metal-oxide semiconductor (MOS) memory (affected by falling DRAM prices), other MOS devices and parts for semiconductors. The number of semiconductors imported from Japan dropped only 0.7 percent from 1989 to 1990.

Western Europe

Western Europe—EC and other countries—continues to be the largest regional market for U.S. semiconductor manufacturers, accounting for approximately 18 percent of exports. U.S. companies, through a combination of exports and local production, control over 40 percent of the Western European market.

The importance of the Western European—and specifically EC—semiconductor market to U.S. and other non-European companies has been highlighted by the recent wave of investment in the region. Since 1985 at least 10 leading semiconductor companies have opened or announced plans for placing production and assembly facilities in the EC. The average cost of such facilities exceeds $100 million.

Smaller companies that do not have the capital to build a facility in the EC are looking at joint ventures as a way to establish local production. Semiconductor producers are aware that their buyers, faced with a 14 percent tariff on imported chips and uneasy about local content requirements and point of origin rules, prefer a European source for components.

In mid-1990 the European Commission dropped its proposal for a value-added rule of origin on printed circuit board assemblies (PCBAs) this would have had the effect of reducing U.S. component content on assembled boards entering the EC. The rule of origin issue is currently being discussed in the General Agreement on Tariffs and Trade (GATT) Uruguay round and the final EC determination on how to structure any PCBA rule of origin will be shaped by the final GATT agreement.

EC semiconductor producers have responded in part to the increased pace of competition in their domestic market by engaging in collaborative research. The Joint European Submicron Silicon Project (JESSI) was formed in 1989 to help EC companies pool research efforts. Funding for the project is provided by member companies, the EC, and national governments. In 1990 JESSI suffered a setback when Philips, one of the project's main participants, suffering operating losses, withdrew from the advanced memory chip program.

Projects like JESSI and recent collaborative efforts between EC, U.S. and Japanese producers signal that European semiconductor manufacturers are aware of the danger of being left behind technologically. The large size and strong

Table 1: U.S. Trade Patterns for Semiconductors and Related Devices (SIC 3674), 1990

(Millions of dollars, Percent)

	Exports Value	Share	Percent Change 1989-90		Imports Value	Share	Percent Change 1989-90
EC-12	1674.2	16.0	7.6	Japan	3241.2	27.0	−14.3
Malaysia	1464.7	14.0	7.5	Korea, South	1806.7	15.1	−1.0
Canada	1273.3	12.2	-.9	Malaysia	1659.6	13.8	.3
Singapore	988.1	9.5	17.0	Singapore	1060.2	8.8	1.9
Japan	966.3	9.2	6.6	Canada	966.5	8.1	7.3
Korea, South	866.9	8.3	19.5	EC-12	834.7	7.0	7.8
Taiwan	749.0	7.2	17.0	Taiwan	628.8	5.2	6.0
Philippines	554.8	5.3	8.5	Philippines	562.9	4.7	12.9
Hong Kong	550.3	5.3	23.6	Thailand	386.7	3.2	8.8
Thailand	471.8	4.5	11.4	Mexico	351.7	2.9	-.6
Other	896.1	8.6	−47.3	Other	496.6	4.1	−54.9
World Total	10455.3	100.0	9.7	World Total	11995.6	100.0	−1.5

growth potential of the EC semiconductor market ensures that the intense competition between domestic, U.S., and Far East companies will continue, especially as U.S. and Japanese production facilities currently under construction come online in the mid-1990s.

The United Kingdom and Ireland may surpass Germany as the largest semiconductor market in the early 1990s, largely because of the arrival of foreign computer companies. Germany currently leads EC semiconductor production, accounting for approximately 30 percent of the $3 billion total, followed by the U.K. (22 percent), France (19 percent), the Netherlands (13 percent), and Italy (7 percent). While EC semiconductor sales are experiencing strong growth, the market may become flooded when all the new fabrication facilities come online in the mid-1990s. The EC semiconductor market is expected to grow by 10 percent in 1991.

Eastern Europe and the Soviet Union

The initial optimistic scenarios that grew out of the political and economic changes in the former Eastern Bloc have become more and more tempered by the realization that severe economic problems persist. Consequently, the expected release of pent-up consumer demand has resulted in only a slight increase in the flow of goods and foreign investment into the region. U.S. semiconductor exports to Eastern Europe have traditionally been negligible, totalling just under $1 million for both 1989 and 1990. However, the level of direct exports will accelerate following the relaxation of the Coordinating Committee for Multilateral Export Controls (COCOM) restrictions.

The foreign trade organizations (FTOs) that used to act as the only gateway for imports and exports of electronics goods are having to compete with private importers and former state-run companies that now have import/export licenses. Eastern European buyers will approach U.S. suppliers directly and U.S. companies should be prepared to take advantage of the freer access to Eastern European markets now permitted. Although the current sales volume is small, the creation of supplier/buyer relationships should prove profitable for U.S. firms in the long run.

The technical level of Eastern European semiconductor manufacture remains far behind that of the West. Although the former German Democratic Republic (GDR) did produce a 1M DRAM, yield levels were so low that the enormous expense of the program was not justified. The Soviet Union has established several sophisticated semiconductor production sites, geared primarily to defense needs. The current move towards commercial usage of defense production within the Soviet Union will probably lead to increased efforts to enter the commercial marketplace. U.S. imports of low-end devices from Eastern Europe have increased, although they totaled only $750,000 for 1990.

Japan

Japan is the largest producer of semiconductors in the world. Japan is America's top-ranked import partner, exporting $3.2 billion to the U.S. in 1990 while the U.S. exported $966.3 million in semiconductors to Japan.

Although the Japanese market for semiconductors is experiencing slow growth, demand for microprocessors and controllers, digital/audio converters, and EPROMs will continue to rise in Japan. These markets should remain good for U.S. suppliers.

Japan is the largest single market for semiconductors, representing almost 40 percent of the world market, and expanding. Access to this important market has a major impact on the U.S. industry's ability to compete internationally.

In 1990 the United States and Japan entered the fourth year of the U.S.-Japan Semiconductor Trade Arrangement. While foreign access to the Japanese market improved somewhat, from 11.9 percent in 1989 to an estimated 13.4 percent in 1990, market share remained below industry expectations. Sanctions, imposed in April 1987 for Japan's failure to comply with the arrangement's market access provisions, continue. The sanctions consist of 100 percent tariffs on Japanese laptop and high-performance desktop computers and electro-pneumatic hammers.

The U.S. Government and the Government of Japan continued their practice of exchanging views on the Arrangement, and held formal consultations in April and October 1990. Following U.S.-Japan discussions at the government and industry levels, greater numbers of Japanese semiconductor users formulated and updated market access plans (MAPs) aimed at increasing their purchases of foreign chips. Positive efforts by Japanese firms include creating incentive awards for buying foreign chips; establishing market share targets, which reflect future foreign purchases, and preparing lists of semiconductor products for which an immediate purchasing need exists. To promote greater access to the Japanese end-use markets, such as consumer electronics, telecommunications, high-definition systems, and the automotive markets, joint U.S.-Japanese industry groups have held seminars, conducted studies examining foreign strengths and market access progress, and circulated product lists identifying Japanese requirements. U.S. companies are aggressively broadening their presence in Japan and have developed Market Promotion Plans (MPPs), informing Japanese semiconductor users about their capabilities and efforts to serve Japanese customers.

In conjunction with the Arrangement, two outstanding independent dumping cases against Japanese companies were suspended in 1986. Under the suspension agreements with Japanese companies, most Japanese producers of Erasable Programmable Read Only Memory semiconductors (EPROMs) and 256K and above Dynamic Random Access Memory semiconductors (DRAMs) are committed to selling their products in the U.S. market at or above their foreign market value (FMV). On August 31, 1990, counsel for seven signatories to the suspension agreements requested that the DRAM and EPROM suspension agreements be terminated. On September 14, 1990, the U.S. Department of Commerce initiated an administrative review to determine whether termination of the suspension agreements is appropriate. A final determination is expected by August 30, 1991. While the U.S. Government has not detected any dumping of semiconductors, the danger of dumping remains in situations where consumption is falling rapidly. In the face of lower demand, the pressure to reduce DRAM prices may lead to dumping.

Several recent studies focus on the competitive position of the United States electronics industry relative to Japan, and of the importance of the semiconductor industry as the supplier of components to this vital industry. These studies conclude that U.S. leadership in these industries has eroded, necessitating steps to enhance U.S. competitiveness. The electronics and semiconductor industries are considered essential to the national defense and economic security of the United States. These studies include the National Advisory Committee on Semiconductors' report to the President and Congress, *A Strategic Industry at Risk*, and the U.S. Department of Commerce's *The Competitive Status of the U.S. Electronics Sector from Materials to Systems.*

East Asia

East Asia is an excellent market for semiconductors, especially for consumer electronic use. Malaysia, Singapore, South Korea, Taiwan, the Philippines, Hong Kong, and Thailand are all major producers of consumer electronics, thus their demand for semiconductors from U.S. and other sources is strong. South Korea and Taiwan also produce telecommunications equipment, computers, and computer peripherals, three other major uses for semiconductors.

Singapore, the Philippines, Hong Kong, Malaysia, and Thailand are assembly and testing locations used by Japanese and U.S. semiconductor manufacturers. While prospering from the increase in jobs from semiconductor assembly and testing plants, these East Asian countries have not developed or acquired sufficient technology to develop a domestic industry.

However, South Korea and Taiwan developed not only a domestic semiconductor industry, but also rival Japan in the DRAM market. Although both countries suffer from high interest rates and an undersupply of workers trained in electronics, they are continuing to develop their domestic industry. Their companies are trying to diversify their product lines because too many companies offer the same products, particularly low-end memories.

South Korea is one of the fastest growing markets for semiconductors. Japan is the major supplier to the Korean market, followed by the United States. South Korea will continue to be an excellent market for U.S. semiconductors, especially in the high-end market.

Following current trends in electronics exports, South Korean companies are moving from consumer electronics into higher-end products. The value of South Korean-produced electronic parts and components, including semiconductors, has surpassed that of consumer electronics.

To help South Korean electronics companies compete with their Japanese and U.S. counterparts, the Government of Korea has implemented a five-year plan that provides approximately $40 billion for technology development and plant investment in sophisticated industries, including semiconductors.

South Korean semiconductor companies primarily produce memory devices. Korean technology in DRAMs has reached the 1M and 4M level (although they are experiencing some development problems in 4M) and research continues in the 16M and 64M DRAMs. Wafer production has reached the 6-inch level. South Korean companies are entering the ASIC and custom market to cushion the effects of the falling prices of memory semiconductors. At least one major Korean company is shifting its focus from DRAMs to SRAMs and Mask ROM production.

Problems in South Korean semiconductor production include a low yield rate, very little cooperation between companies, and a history of labor unrest. Because most technological advances in semiconductors have come from outside South Korea, information on new technologies is difficult to obtain. Labor costs are low, but as South Korea becomes more prosperous, wages are likely to rise.

In 1990, the U.S. exported $749 billion in semiconductors to Taiwan. Japan leads in exports to Taiwan, with the U.S. ranking second. Taiwan's IC market, valued at $1.9 billion in 1988, is expected to grow at a rate of 40 percent per year. Demand for semiconductors will reflect rising production of telephones, calculators, televisions, and audio products. Semiconductors for computers and peripherals will continue to be a good market for U.S. companies since most of the locally made computer products are OEM items for U.S. firms. Chip sets for computers are already becoming key products for Taiwanese semiconductor producers and exporters to Taiwan.

Taiwanese companies are feeling the effects of offering overlapping product lines, underutilized wafer fabrication facilities, slow return on investment, and high capital costs involved in semiconductor production. Some analysts predict a shakeout in the Taiwanese market in the near future.

However, all of the major Taiwanese electronics companies have invested heavily in semiconductor production. The number of semiconductor fabrication plants in Taiwan has expanded over the last 10 years from 0 to 7. By 1993, the number could double if the Taiwanese broaden their product lines.

Outlook for 1991

U.S. exports are expected to increase by approximately 10 percent in 1991, fueled by increased demand in the Far East and EC. Domestic shipments are projected to grow by 8 percent in 1990-1991, with the telecommunications sector providing the most active market. If, however, the Gulf crisis continues and the economy worsens, semiconductor shipments growth would be adversely affected.

As the overseas markets for semiconductors grow offshore production and exports contribute to the globalization of the industry. Several U.S. semiconductor companies received over 40% of their revenue from outside of the U.S. in 1990. Competition from foreign companies, and the need for better customer service, quality, and just-in-time delivery are driving U.S. companies to invest abroad. Overseas markets, especially East Asia and the EC are growing faster than the United States.

Long-Term Prospects

Demand for semiconductors will continue to be driven by the computer, telecommunications, and automotive markets. The use of chip sets and custom devices, such as analog to digital circuits in the automotive industry, is expected to soar. The EC and East Asia will be the fastest growing market for semiconductors from 1990–1994, outperforming the domestic U.S. market.

Capital expenditure by semiconductor manufacturers is expected to increase most rapidly in the EC during 1990-1994, with that region's 20-percent increase outperforming the U.S. and Japan, both of which will each experience 15 percent growth.—*Dorothea Blouin (202)377-1333, Robert Scott (202)377-2795, Marguerite Markey Nealon (202) 377-8411, Office of Microelectronics and Instrumentation, (202) 377-8411, October 1990.*

ELECTRONIC COMPONENTS OTHER THAN SEMICONDUCTORS

Slow, uneven growth characterized 1990 for U.S. producers of components other than semiconductors (SICs 3671-2, 3675-79). Domestic shipments totaled approximately $38 billion in 1990, which represented a 2.5 percent constant dollar increase over 1989 levels. A growth rate of 4.2 percent is expected in 1991, with 1992 shipments anticipated to rise by 5 to 6 percent. Exports will lead the expansion in both 1991 and 1992, primarily with sales to the European Community and Pacific Rim markets. Growth will be augmented by a gradual upturn in the domestic market during this period.

The component categories covered in this section are: electron tubes (SIC 3671); printed circuit boards (SIC 3672); capacitors (SIC 3675); resistors (SIC 3676); coils and transformers (SIC 3677); connectors (SIC 3678), and electronic components, not elsewhere classified (SIC 3679).

In the second half of 1989 and throughout 1990, component producers experienced slack demand in the domestic market, with accompanying downward pressure on pricing and profit margins. Companies have implemented business strategies that they expect will bring them through the near-term difficulties and enable them to take advantage of any future upturn in the market. The industry has sharply reduced personnel, consolidated product lines, increased the use of quality management techniques, and emphasized exports.

Total employment in 1990 declined to 350,000 workers, a 2.2 percent drop from 1989 levels and a 8.9 percent reduction from 1988. The majority of layoffs has occured among administrative and non-technical personnel. The industry continues to undergo a consolidation process driven by the cutback in component suppliers by original equipment manufacturers (OEM), overcapacity, and the abundance of interchangeable products being offered by competing suppliers.

As example of the consolidation going on in the component industries, Fleck International forecasts that the connector industry will see a reduction from 500 domestic producers currently to only 100 by 1995. While the severity of the shakeout is unclear it has occurred in all product sectors, underscoring how vulnerable producers of mature product lines are to periods of slow growth.

The recent easing of East-West tensions has reduced sales to the military market. The Electronics Industry Association (EIA) has forecast that defense spending will decrease at an annual rate of 2 percent over the next 10 years. As the military balances a loss in numbers with upgraded technological capabilities, the proportion of defense expenditures committed to electronics research, test and engineering, and procurement will increase. The Persian Gulf crisis has further clouded the short- to medium-term outlook, with some component producers experiencing increased military sales attributable to the U.S. buildup. The long-term trend for electronics companies, however, is clearly away from overexposure in the military market. The situation is underscored by one major defense contractor's recent announcement that it intended to fully divest itself of all military electronics divisions.

Some major component end-user markets, among them computers, telecommunications equipment, and automobiles are experiencing their own periods of slack demand. Consequently, a flattening of new orders for components has triggered a decrease in inventories among producers and put downward pressure on pricing. Tighter profit margins have led many companies to curtail capital and R&D expenditures, weakening the U.S. industry's ability to remain competitive in the long run. Some argue that R&D levels are adequate, but that development times must be reduced by the parallel inclusion of manufacturing, design and marketing into the development phase of the product.

The push toward stretching R&D dollars has led some companies to investigate joint research projects with other individual companies, universities, and industry consortia. Although the potential benefits of pooled research are very attractive, the actual implementation of such programs can be problematic. Companies accustomed to their own decision-making process often are initially reluctant to compromise on the procedures and goals of the project. Participants have to identify the scope and purpose of the research, allocate funds and personnel, and agree on the internal use and external dissemination of research results.

In addition to collaborative efforts under way in the private sector, the U.S. Department of Commerce's National Institute of Standards and Technology, (NIST) is working to facilitate cooperation among component producers. During 1990 NIST began discussions with U.S. producers of ceramic multilayered chip capacitors (MLCs), as well as their suppliers and customers, on the possibility of forming a consortium to address the issue of mechanical reliability of the MLCs. Being based on ceramics, MLCs

Trends and Forecasts: Electronic Parts, Except Semiconductors (SIC 3671-2, 3675-9)

(in millions of dollars except as noted)

Item	1987	1988[1]	1989[2]	1990[2]	1991[3]	Percent Change 1987-88	1988-89	1989-90	1990-91
Industry Data									
Value of shipments[4]	30,463	35,502	36,616	37,714	39,599	16.5	3.1	3.0	5.0
Value of shipments (1987$)	30,463	34,709	35,619	36,509	38,039	13.9	2.6	2.5	4.2
Total employment (000)	363	384	358	350	340	5.8	-6.8	-2.2	-2.9
Production workers (000)	242	258	253	245	239	6.6	-1.9	-3.2	-2.4
Average hourly earnings ($)	8.86	9.54	9.67	10.02	—	7.7	1.4	3.6	—
Capital expenditures[2]	1,180	1,322	—	—	—	12.0	—	—	—
Product Data									
Value of shipments[5]	28,790	33,440	34,443	35,441	37,106	16.2	3.0	2.9	4.7
Value of shipments (1987$)	28,790	32,645	33,506	34,309	35,645	13.4	2.6	2.4	3.9

[1] Advance data from the 1988 Annual Survey of Manufactures.

[2] Estimate.

[3] Forecast.

[4] Value of all products and services sold by establishments in the electronic parts, except semiconductors industry.

[5] Value of products classified in the electronic parts, except semiconductors industry produced by all industries.

SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA). Estimates and forecasts by ITA.

fail randomly in service due to cracks that result from defects introduced or exaggerated during manufacture or assembly. A collaborative effort on the part of manufacturers and users should improve the product, with tangible benefits accruing to all involved.

Product Development

Steady technological progress continues in component materials development and manufacturing techniques. TV cathode ray tube (CRT) manufacturers are developing technologies that they hope will allow them to compete with flat panel displays in the high-definition television (HDTV) market. Upgraded CRTs have become more viable because flat panel displays are encountering technological and pricing barriers years away from entry into the commercial market. CRT manufacturers will continue to hold an advantage in the developing HDTV market as long as the more exotic flat-panel technologies, such as plasma, active matrix liquid-crystal displays, and vacuum microelectronics are unable to generate a large display that can compete with a CRT on a cost and quality basis. By increasing the speed at which electron beams scan the screen and controlling the beams more precisely, CRT manufacturers can produce high definition displays of up to 40 inches in diameter.

Printed circuit board (PCB) manufacturers continue to upgrade in-house design capabilities in order to interact with customers at an earlier stage in the production process. Instead of waiting to be presented with board layouts and specifications by the customers, PCB shops now are working increasingly with customers to help create the final design. Although the up-front board costs may be higher with a PCB shop that has committed itself to higher quality and technology by utilizing computer-aided design and manufacturing (CAD/CAM), the savings in inspection as well as rework and repair charges will provide overall price reductions to the buyer.

New PC-based board design software packages have become more sophisticated and are providing PCB manufacturers with a lower cost alternative to packages designed to run on workstations. PC based packages now contain a wide choice of pad and track sizes, automatic and interactive parts placement, and design rule checking. PCB manufacturers also are using CAM stations to control such processes as image transferring and drilling.

Capacitor manufacturers are meeting the challenge presented by customers demanding quality levels of defects per billion, rather than per million. Failure analysis techniques now include fractography, which analyzes entire crack surfaces and helps identify the stresses affecting board-mounted ceramic components. Advances in ceramic materials, such as the introduction of lead magnesium niobate based ceramics in place of barium titanate, have allowed for higher dielectric constants and smaller, more efficient MLCs. Ceramic capacitors represented approximately 45 percent of the global capacitor market in 1990, with chip capacitors for surface mount applications expected to account for 80 percent of ceramics shipments by 1995.

Tantalum capacitors, which represent the second largest market segment by value, are requiring less tantalum powder to maintain necessary electrical properties. This development of new powders will reduce unit costs and is expected to double the capacitance by volume, thereby reducing capacitor size. The rapid increase in types of surface-mount products has brought a need for standardization. The Electronics Industry Association is considering the adoption of four basic size designations for surface mount capacitors incorporated under one standard designation.

Resistor manufacturers also are busy reducing size while upgrading performance. One leading producer recently introduced a surface mount resistor with dimensions of 1.0 × 0.5 × 0.35 mm, approximately the size of a grain of pepper. As is the case for capacitors, resistor manufacturers are developing items for the growing automotive applications market and are experiencing increased demand for surface mount products. The recent softness in the automobile market and evidence that the growth in surface mount sales is simply balancing a decline in leaded resistor sales has slowed investment in surface mount techniques.

Connector manufacturers are finding fiber optics to be the most active market sector, with increased telecommunications and computer networking applications providing the impetus for strong growth. The advent of surface mount technology (SMT) has brought with it a wide array of connector systems that are fitted directly to the printed circuit board, thereby saving space. Printed circuit board connector sales have benefitted from the increased use of personal computer networks. Newly developed corrosion resistant composite connectors have found markets with the military and automobile industries.

Because of SMT, guidelines in the design, selection, and usage of surface mount connectors are needed. The Institute for Interconnecting and Packaging Electronic Circuits (IPC) has produced a number of documents that provide guidelines and assist designers in effectively interconnecting a package.

INTERNATIONAL COMPETITIVENESS

The U.S. recorded a $1.3 billion trade deficit in 1990 in electronic components other than semiconductors, an improvement of 24 percent over 1989's $1.7 billion figure. Exports, primarily into the European Community and Far East, increased by 21 percent, while imports rose by only 13 percent. U.S. companies, facing flat domestic demand and assisted by a devaluation of the dollar, have focused on foreign markets for increased revenue.

The largest regional market for U.S. tube manufacturers was the EC, which accounted for 22 percent of the $590 million in total exports. The EC market for tubes, currently at $3 billion, is anticipated to outperform other regional markets in the near term and continue to provide U.S. exporters with a strong market. Exports of TV tubes have concentrated on Mexico, where they are assembled into TVs and reexported into the U.S. market. East Asian producers continue to dominate U.S. imports, with Japan alone accounting for 54 percent of the $800 million total.

Printed circuit board manufacturers continue to find their largest markets in the EC, with the U.K., West Germany, Ireland, and France each accounting for over $40 million in U.S. exports. Assembly operations in the Far East, responding to growing regional demand for finished products, also are providing U.S. suppliers with increased sales opportunities. Singapore alone imported nearly $50 million worth of U.S. boards in 1990.

Capacitor and resistor exports have followed similar patterns, with Latin America, East Asia, and the EC each accounting for approximately one-third of U.S. exports. Capacitor exports in 1990 totaled $507 million, a 10 percent percent increase over 1989 levels. Foreign sales of resistors remained flat at $250 million. Connector exports rose 9 percent over 1989, with fiber optic connectors accounting for the majority of the growth. The EC once again proved to be the primary market for U.S. connectors, accounting for 43 percent of total exports.

The recent surge in production and consumption of electronics in the Pacific Rim region has challenged U.S. component producers to establish and increase market share in what is for many of them a non-traditional market. Many U.S. companies, which had until now focused on the EC as their primary export market, are becoming increasingly involved in Malaysia, Thailand, and Singapore.

U.S. firms attracted to the size and growth potential of the EC are finding that a patchwork of marketing strategies and distribution channels are needed to enter the different regional and national markets contained within the EC. Within the EC, Germany represents the largest market for components, accounting for approximately 30 percent of demand. The recent addition of 16 million consumers from the former DDR will only expand this market. The UK (23 percent) and France (17 percent) followed, while Italy has experienced strong demand growth and become an attractive market for numerous U.S. suppliers. To take advantage of the European market, many firms are increasing local production capacity and upgrading marketing and service efforts. Component producers are also following their major buyers into the EC, with a number of them collocating production facilities in Ireland, Spain, and Italy.

Eastern Europe is an attractive potential market, but problems with currency convertibility, private property laws, and distribution and service arrangements remain. Foreign Trade Organizations (FTOs) such as Transelektro and Metrimpex in Hungary, Unitra and Elektrim in Poland, and KOVO in Czechoslovakia have in the past decade relinquished their monopolies on trade in electronics, and currently account for only 40 percent of foreign trade. Individual domestic producers, which are currently in the process of privatization, are setting up their own import/export operations. U.S. producers will have to identify these new companies as they represent both direct sales opportunities and potential partners for production and distribution arrangements.

Outlook for 1991

A moderate increase of 4.2 percent is expected for components shipments in 1991. Electron tubes and assorted components subsumed under the "not elsewhere classified" category, among them microwave components, switches, and printed circuit assemblies, will experience the strongest growth rates. The growth projection is based on a recession-free economy, and could be adversely affected by prolongation of the Persian Gulf crisis.

Foreign markets should continue to respond to the devaluation of the dollar, which should benefit U.S. manufacturers. The trade deficit for components should continue to decline, reaching an estimated $1 billion in 1991 as opposed to $1.3 billion in 1990.

Long-Term Prospects

Growth in domestic shipments is anticipated to increase by an average of 5 percent annually in the 1990-95 period. A continued consolidation of the producer base within each component segment is expected.

OEMs will continue to ask their suppliers to implement total quality management (TQM) techniques and just-in-time (JIT) delivery. Companies that do not meet these requirements will be dropped from preferred vendor lists. Customers will accept higher prices as long as on-time delivery and excellent quality levels that are good enough for ship-to-stock programs are achieved. Component end-users continue to move toward reductions in inventories, counting on their suppliers for quick delivery capabilities. OEMs are also setting up Electronic Data Interchanges (EDI) with their component suppliers. EDIs allow for the direct transmittal of order information, thereby cutting down on delays.

Companies will need to become involved in establishing industry standards, with those companies taking an active role benefiting from increased future sales. Strategic partnerships between OEMs and component producers will offer cost reduction and increased product development cycles, but can also place partners in overly dependent relationship. Benefits and risks have to be weighed by the companies involved.—*Robert Scott, Office of Microelectronics and Instrumentation, (202) 377-2795, October 1990.*

SEMICONDUCTOR MANUFACTURING EQUIPMENT

Sales growth was minimal in 1990, due to over-capacity in the world market for certain generations of dynamic random access memory devices (DRAMs), and a slow domestic economy. Sales should improve modestly in 1991 (by 5 percent), with the continued growth of markets in the Pacific Rim, and the revamping of fabrication lines for new generations of devices.

The semiconductor manufacturing equipment (SME) and materials industry consists of four primary product areas: wafer processing,test and inspection, assembly equipment, and electronic materials. Other peripheral product segments include computer-aided design, mask/reticle making equipment, and wafer growing equipment. Electronic materials include silicon, gallium arsenide, sputtering targets, photoresists, gases and chemicals, and packaging materials (ceramics, leadframes, encapsulation resins, bonding wire, hybrid packages, and thick film pastes). The majority of devices are manufactured using silicon wafers as a base. Gallium arsenide devices are slowly gaining in popularity, with applications as integrated circuits and light-emitting diodes.

Wafer processing is the most capital intensive phase of the production process and represents just over 50 percent of the dollar value of equipment sales. Processing steps include epitaxy, oxide preparation, micropatterning (lithography and etch), diffusion, ion implantation, passivation, and metallization. Testing of a device occurs throughout wafer processing, via optical and electrical means. Test and inspection equipment represents approximately 25 percent of equipment sales. Because assembly of devices was labor intensive, many companies established assembly fabrication lines in developing countries. However, as this process becomes more automated and requirements for particle-free manufacturing extends throughout device processing, there is less incentive to move this production step to low-wage economies and from the core manufacturing facility. Assembly equipment represents approximately 9 percent of the total equipment market.

The importance of the semiconductor device, equipment, and materials industries to U.S. national and economic security is being recognized by more and more officials in Government and industry.

A number of efforts have been taken to stem this decline. These include: the creation of SEMATECH in 1987, an advanced-technology industry research consortium; an attempt by industry between 1989 and 1990 to structure a production consortium for advanced DRAMs; and the creation of the National Advisory Committee on Semiconductors (NACS) by the National Advisory Committee Research and Development Act of 1988.

This committee has highlighted the decline in competitiveness of the U.S. semiconductor, equipment, and materials industries. Their report released in 1990 on the U.S. equipment industry concluded that explanations for this erosion include: the decline of the U.S. device industry; lack of adequate capital due to its high cost and lack of investor confidence; and the inability of companies to achieve a critical volume of overseas sales.

SEMATECH was established in 1987 as a joint government-industry effort to boost manufacturing capabilities of U.S. semiconductor producers, largely by improving relationships between the producers and their equipment and materials suppliers. The research consortium also has as its goal achieving 0.5 micron line widths by 1992 (achieved in 1990) and 0.35 micron line widths by 1994. Only U.S. equipment and materials will be used to achieve these production parameters. SEMATECH works closely with semiconductor manufacturers, semiconductor equipment and materials producers, academic institutions, and government agencies, including the Defense Advanced Research Projects Agency (DARPA), the Department of Energy's research laboratories, and the National Institute for Standards and Technology. Half of SEMATECH's budget comes from member device companies, and half from DARPA.

One of SEMATECH's strategies to improve the supplier/customer dialogue is through technology transfer. Manufacturing techniques are transferred via numerous workshops and seminars, and through the employees that member companies assign to SEMATECH. SEMATECH also has established joint development and equipment improvement contracts with U.S. semiconductor manufacturing equipment (SME) and materials producers. Projects include the development of a sub-micron reticle and mask exposure system, an advanced metal deposition procedure, new automatic test equipment, and gas control technology. The transfer process is also typified by SEMI/SEMATECH, an organization of U.S. equipment, materials, software and services companies established in 1987.

SEMATECH's contribution to technology developments should prove very useful to U.S. equipment manufacturers. The life cycle of most semiconductor equipment is getting shorter and shorter. With each new generation of dynamic random access memory devices (DRAMs), lithography equipment must achieve smaller line-widths, deposition and etch equipment must become more precise, and test equipment must achieve higher pin counts and speed. With companies spending an average of 16 percent of revenues on research and development, SEMATECH's research base should prove an invaluable additional resource.

SEMATECH's efforts to change the way device producers view the equipment and materials suppliers will be beneficial to both industries. These efforts focus on making the semiconductor manufacturers realize the advantages that can accrue from long-term and continuous communication of technical and performance parameters to U.S. equipment providers. Device manufacturers should consider providing equipment companies with data on the performance of their product, and entering into longer development contracts with their suppliers. Such a relationship would stabilize and improve the performance of U.S. equipment and materials companies just as such relationships have bolstered Japanese equipment manufacturers. Technology Opportunities

A new semiconductor generation is typically introduced every three years. Most recent is the shift from the one (1.0 micron geometries) to the 4-megabit (MEG) DRAM (0.8 micron). Soon companies will shift to producing 16 (0.6 micron) and then 64-megabit DRAMs. The most critical technology for these sub-micron devices is pattern delineation, specifically the lithography and etch processing steps.

The industry is debating which lithography process is most appropriate for DRAM generations following the 64-megabit chip. Optical methods have survived far longer than anticipated, with I-line steppers replacing H/G-line equipment for use in 4 MEG DRAM production. Future options as light sources include Deep ultra-violet (UV), E-beams, and X-rays. Japanese companies and government agencies have invested heavily in hard X-ray sources, and have built at least a dozen large synchrotron. There are only two large synchrotron rings in the United States, with two more in the planning stage. U.S. companies and researchers, including SEMATECH, are focussing on deep UV, and "soft" X-ray sources, methods which are less capital intensive.

Another high-profile technology debate is over the future of the cluster tool concept. As densities of circuits increase, and line widths decrease, the integration of different processes under vacuum (such as deposition and etch) is becoming a necessity. Although more and more companies are pursuing the concept of cluster tools, its general industry acceptance is being delayed until integration standards are fully adopted by the industry.

Another "niche" application is for the manufacture of flat panel displays. The processes used to manufacture the displays mirror those needed to produce semiconductors. However, adaptation of semiconductor production technology will require heavy financial investment, which many companies are unwilling or unable to pursue.

INTERNATIONAL COMPETITIVENESS

Two-thirds of the equipment producers are U.S.-based. However, they supply only 40 percent of worldwide sales, and their market share has declined steadily since the early-1980s. The majority of U.S. companies are small, entrepreneurial firms with a niche product, and sales of $5 million to $25 million. Only a few have established a strong position in the international market, and have been able to generate sales of $200 million and above.

The high costs of doing business contribute to the concentration of market share among a few large companies. Especially costly are researching and developing new product advances and establishing overseas sales and production facilities to enhance foreign market penetration and ensure prompt product servicing.

U.S. companies have a strong position in the following product areas: ion implantation, plasma chemical vapor deposition, etch wafer processing equipment, and linear testers (particularly mixed signal test equipment). Certain U.S. companies also are very competitive in reticle and mask inspection tools (metrology equipment). The only materials segment in which U.S companies remain competitive are gases, photoresists and thick film pastes.

U.S. companies have lost significant market share to the Japanese in optical steppers, resist equipment, memory testers, certain assembly equipment areas such as tape automated bonding and die bond, and the majority of packaging and processing materials.

The efforts of SEMATECH and other research consortia such as Semiconductor Research Corporation may help to advance U.S. technology. Moreover, the research efforts of certain U.S. companies in the field of lithography, such as step and scan equipment, soft X-ray tools, and E-beam write equipment may begin to erode Japan's dominating position in this critical technology area.

The industry has been eroded by a recent avalanche of foreign acquisitions of key equipment and materials companies. Since 1988, the U.S. has lost its recognized leader in sputtering targets; will probably lose its elite gas control manufacturer; has a diminished supply base for polysilicon, and is dependent on foreigners for its supply of silicon wafers. Contributing to this upsurge in foreign investment in the U.S. were a weak dollar, the unwillingness of domestic capital to invest in high-technology fields, and foreign (typically Japanese) interest in U.S. technology.

Sematech

Technicians fine tune the chemical vapor deposition process that helps spawn new device generations.

The Japanese continue to be the dominant investor in SME and materials suppliers. In the area of materials alone, three polysilicon producers, four silicon wafer manufacturers, and two sputtering target producers have been acquired by Japanese companies since 1984. In each of these materials areas, the U.S. has become more dependent on Japanese suppliers. Moreover, many U.S. companies are discovering that a business/investment relationship with Japan can lead to a larger market presence in Japan, as well as provide additional sources of capital.

Japan continues to be both the largest foreign purchaser of U.S. semiconductor manufacturing equipment as well as the most important supplier. To achieve sales volume, U.S. equipment producers must have a presence in the Japanese market (which represents approximately 50 percent of the world market).

The EC has always been a major market for equipment, consistently representing approximately 12 percent of worldwide market share. South Korea is the most rapidly expanding market. Its semiconductor manufacturers are making a major push in DRAM production, attempting to rival the U.S. and Japan. Singapore, Taiwan, and Malaysia also offer sales potential, especially for back-end or assembly equipment.

With the relaxation of some export controls, Eastern Europe and the Soviet Union may now provide some market opportunities for U.S equipment producers. Their institutions, universities and businesses are potential markets for the less sophisticated production equipment. Selling to these markets can, therefore, generate high profit margins for companies that are able to find a customer with some hard currency.

Changes in the export regulations include: exports below $5,000 do not need CoCom review for licensing; only national discretion is required for a license for exports valued at less than $50,000; most equipment will be decontrolled to the "China Green Line," with a core list of controlled equipment focussing on lithography and etch equipment capable of 2 micron and smaller line widths.

Outlook for 1991

U.S. equipment companies faced minimal to no growth in 1990. The outlook for 1991 is somewhat better, with a forecast of 5 percent expansion (current dollars). Companies that can compete effectively in the Japanese market will be most successful. However, both the Japanese and European markets are approaching saturation, as shown by falling one-megabit DRAM prices and reports of declining capital expenditures by the Japanese device producers. The possibility of war in Iraq, and general softening of the Western economies will further dampen demand in 1991.

Offsetting this downward trend will be the inevitable re-equipping of fabs for 4- and 16-megabit DRAM production; greater demand for flat panel display production equipment; and expansion of some less traditional markets. Taiwan and South Korea will continue to be the fastest growing markets for equipment companies, while Eastern Europe and the Soviet Union will provide a few sales opportunities for the more adventurous companies.

Long-Term Prospects

The long-term outlook for U.S. equipment producers is mixed. U.S. semiconductor equipment companies must have adequate domestic capital sources such as tax credits and/or subsidies, or pooled development/production funds generated by consortia to pursue new technologies. The first source will require changes in the tax law, while the second will require relaxation of antitrust rules. Their future also depends on forging much closer business relations with U.S. device producers.

The plethora of joint development contracts between U.S. and Japanese companies often appears a mixed bag. Their ability to provide additional capital is welcome. However, it's questionable whether development or production contracts between Japanese and U.S. companies have opened the Japanese market. Moreover, some of these arrangements have led to intellectual property rights violations that can quickly erode any company's initial market gains.

Support for the U.S. industry comes from the efforts of SEMATECH, the continued ability of U.S. entrepreneurs/engineers to devise excellent new products, and the growing market acumen of U.S. producers.—*Sarah Cooper Hall, Office of Microelectronics and Instrumentation, (202) 377-2846, October 1990.*

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Advanced Materials

Many advanced materials manufacturers are still in the embryonic stage, and produce low-volume, high value-added products for market niches. Many rely on military contracts for R&D funding and for end users. Advanced materials include fiber composites, metal matrix composites, and advanced ceramics. Growth in these industries should remain strong for the next 5 to 10 years, although there may be a slowdown in R&D if the defense budget is cut. Any decrease in military procurement that includes the materials discussed in these sections will adversely affect demand.

There are no SIC codes for these industries, except powder metallurgy, so there are no data from the Bureau of the Census. Industry sources supply some data, but companies dependent on government funding for developing and/or manufacturing products with military applications often keep data secret for strategic reasons.

Exports of high technology products are often covered under the export control program, which restricts sales of strategic importance.

As biotechnology gains in health care and agricultural applications, it could account for $5 billion in sales by the mid-1990s. Engineering plastics should also exhibit strong growth, based on increased use in the automotive sector. The powder metal industry, which also relies principally on the automotive sector, is expecting a slight decrease in shipments for 1991; but over the next 10 years, the weight of powder metal parts in cars should double.

For other topics related to this chapter, see chapters 12 (Chemicals and Allied Products: Regulations in the Chemical Industry), 14 (Plastics and Rubber), 15 (Metals), 16 (General Components), 17 (Electric Components and Superconductors), 19 (Metalworking Equipment), 21 (Electrical Equipment), 22 (Aerospace), 28 (Computer Equipment and Software), 37 (Motor Vehicles and Parts), 39 (Personal Consumer Durables: Sporting and Athletic Goods), 42 (Space Commerce), 45 (Drugs) and 46 (Medical and Dental Instruments and Supplies: Surgical Appliances and Supplies, Dental Equipment and Supplies).—*David A. Cammarota, Office of Metals, Minerals, and Commodities, (202) 377-0575, August 1990.*

BIOTECHNOLOGY

Biotechnology is a set of scientific disciplines and technologies that use biological processes or organisms to produce goods and services. It encompasses such diverse disciplines as molecular and cellular manipulation (including recombinant DNA and monoclonal antibody technologies); enzymology; protein engineering; x ray crystallography; biomolecular instrumentation; industrial microbiology; bioprocess engineering (fermentation, cell culturing, and separation and purification technologies); and embryo sexing, manipulation, and transfer. Biotechnology also encompasses traditional plant and animal breeding; use of micro-organisms to make fermented beverages and foods, antibiotics, enzymes, vitamins, amino acids, etc.

The development of new biotechnology tools, particularly recombinant DNA (or genetic engineering) and monoclonal antibody (MAbs) production technologies in the mid-1970s, spawned hundreds of new companies and sig-

Pfizer Inc.

Biotechnology includes enzymology and computer modeling of new kinds of molecules. Here scientists use computer modeling of renin, a complex kidney enzyme, in the search for new antihypertensive agents.

Damon Biotech

These reactor vessels produce pure monoclonal antibodies (MAbs) for an increasing number of biomedical applications. Based on the large number of products in the R&D pipeline, market values could reach $4 to $5 billion by 1995.

nificant investment to develop new substances, increase the production of rare substances, and improve manufacturing processes.

Recombinant DNA technology makes it possible to transfer specific genetic messages from one organism to another, and stimulate the second organism to produce large quantities of substances such as interferon, growth hormone, and other rare proteins. The same technique has enabled plants to produce their own pesticides. Also, the development of hybridoma cells through the artificial merging of two cells into one has made possible the production of large quantities of chemically identical antibodies, or MAbs, which are valuable tools in medicine, research, and industry because of their ability to recognize and bind to a wide variety of molecules. They are most commonly used in *in vitro* diagnostic tests to identify the presence of specific antigens associated with diseases or conditions. MAbs are also used in treating organ transplant rejection, and in extracting and purifying valuable proteins from mixtures and vaccines. They are soon to be used inside the body to produce X-ray-like pictures of damaged or cancerous tissue that could not be detected before, and as a therapy for septic shock infections.

DNA probe diagnostics make use of genetic information in cells and thus offer even greater accuracy than other diagnostic technologies. DNA probes are finding use in forensic testing to solve crimes and paternity cases, and in testing for genetic diseases and food contaminants.

Gene therapy may enable doctors to treat hereditary diseases and cancer by replacing defective genetic material with normal DNA. The first trials of human gene therapy for patients with advanced melanoma and a severe immune deficiency disorder were set to begin in late 1990.

Since biotechnology is not an industry in itself, but processes integrated into industrial research and production, the Government does not collect or tabulate biotech production, employment, or trade statistics. The statistics that follow are from a variety of sources.

Industrial Structure

Estimates of the number of biotechnology companies vary, depending on definition and criteria (e.g. level of total R&D or activity devoted to biotechnology). In the United States, about 1,150 companies, including subsidiaries of foreign firms, are applying biotechnology. These include about 550 mostly small, new companies founded to exploit recombinant DNA and monoclonal antibody technologies; 200 manufacturing firms, predominantly pharmaceutical, chemical, and agribusiness; and 400 firms that supply the raw materials, instruments, equipment, and services needed in research and production.

These companies are often linked as an industry because they share business alliances and concerns regarding regulations, patent protection, and research and development. Difficulties in raising capital to fund product development have slowed the formation of new companies since the peak years of 1980–84. These difficulties are leading to industry consolidation through acquisitions, mergers, and equity investments. Although there are alliances between U.S. and foreign firms, these are far outnumbered by partnerships between U.S. firms. Estimates of total biotech-related employment are hard to come by, but in 400 firms about 42,000 people are employed.

Industrial Production

Products developed through biotechnology are not sufficiently identified in company reports or in Government data to assess production. According to unofficial estimates, shipments by U.S. firms of products developed through recombinant DNA and monoclonal antibody technologies—mostly pharmaceuticals and diagnostics—were about $2 billion in 1990 (see Table 1). Revised estimates for previous years are: $1.5 billion for 1989, $1 billion for 1988, $600 million for 1987, and $350 million for 1986.

Although sales have grown dramatically over the past five years, most biotechnology R&D is in human therapeutics and agriculture, and these products require long lead times for development and regulatory review (7–10 years and $100 million for new drugs). As a result, many potentially profitable substances have yet to reach the market. In contrast, due to shorter development and approval times, the FDA has approved more than 450 diagnostic kits using MAbs and DNA probes since 1981.

Table 1: Products Developed through Biotechnology[1] on the Market in the U.S.

Product	Treatment or Use (year first approved)
Human Healthcare	
Alpha interferon	hairy cell leukemia (1986), Kaposi's sarcoma (1988), non-A non-B hepatitis (1990[2])
Erythropoietin	anemia associated with kidney disease (1989)
Gamma interferon	chronic granulomatous disease (1990[2])
Human growth hormone	dwarfism (1986)
Insulin	diabetes (1982)
Tissue plasminogen activator	dissolve blood clots (1987)
Vaccines	hepatitis-B (1986)
Monoclonal antibodies (MAbs)	treat kidney transplant rejection (1986), purify blood clotting agents (1987)
Diagnostic tests (MAbs and DNA probes)	diagnose pregnancy & fertility; bacterial and viral infections; cancer; genetic diseases; DNA fingerprinting; forensic and paternity testing, etc.
Agriculture	
Animals:	
Vaccines	colibacillosis or scours (1984), pseudorabies (1987)
Diagnostic tests	bacterial and viral infections, pregnancy, presence of antibiotic residues
Plants:	
Diagnostic tests	diagnose plant diseases (e.g. turfgrass fungi)
Food Processing	
Diagnostic tests	diagnose food and feed contaminants (e.g. salmonella, aflatoxin, listeria)
Chymosin or rennin	enzyme used in cheesemaking (1990)
Other	
Transgenic mice	cancer research
Luciferase TM	detection agent used in food and medical diagnostic tests

[1] Defined as recombinant DNA and monoclonal antibody technologies.

[2] Recommended for approval by the FDA Biological Response Modifiers Advisory Committee; final FDA approval was expected in 1990.

Biotechnology has been responsible for some major medical milestones: a safe version of human growth hormone to replace the natural hormone withdrawn from the market because of possible contamination with a deadly virus; alpha interferon, the only effective treatment for a rare cancer; and a MAb that rids an important blood-clotting factor of the AIDS virus. Biotechnology has also been indispensable in research on AIDS: not only discovery of the virus, but development of diagnostic tests, deciphering the virus' structure, and as a tool in designing new drugs and vaccines. Development of screening tests for the AIDS virus in 1985 and for the hepatitis-C virus in 1990 have helped ensure the safety of the nation's blood supply.

Other biotech pharmaceutical products currently in use include erythropoietin, which treats life-threatening anemia; a therapeutic MAb which prevents rejection of kidney transplants; human insulin; hepatitis-B vaccine; and tissue plasminogen activator, a blood clot dissolver. Genetically engineered mouse models are beginning to be used to study specific human diseases and test experimental drugs. And DNA probes, which can locate specific genetic characteristics, are used to diagnose pathogenic and genetic diseases and to help resolve criminal cases.

Biotech veterinary products include vaccines for pseudorabies and scours. Food industry products include faster, more accurate tests for such food contaminants as salmonella, aflatoxin, and listeria. In 1990, chymosin, or rennin, became the first genetically engineered food product approved in the United States. It offers cheese producers a less costly alternative to the natural version, taken from calf's stomach, which is expensive and of uncertain purity.

Breakthroughs are also occurring elsewhere. A Japanese firm is manufacturing an amino acid called tryptophan, used in feed additives. A Danish firm has developed a detergent containing a lipase enzyme that breaks down protein-based stains. The U.K. approved a genetically engineered yeast in 1990 developed by a Dutch firm that decreases breadmaking time.

International Trade

Since U.S. biotech companies are leaders in commercializing biotechnology, sales of products and services and royalties from licenses have contributed to a positive trade balance. Preliminary data from a National Science Foundation (NSF) survey indicate foreign sales by 48 biotech companies in 1989 were worth $180 million, a quarter of their total sales. The major markets are Western Europe and Japan.

INDUSTRIAL R&D

According to the NSF, industry spent about $2.3 billion on biotechnology R&D in 1990, an increase of 19 percent a year over the $1.4 billion spent in 1987. Seventy-seven percent of industrial research funds is now spent on human health care, the fastest growing field (therapeutics 63%, diagnostics 14%). The remainder goes to plant agriculture (10%), animal agriculture (5%), chemicals and food additives (4%), biosensors and bioinstruments (3%), and other (1%).

Human Health Care

Most commercial applications of biotechnology are occurring in health care because the U.S. Government has supported biomedical research over the past several decades—it now allocates most of its $3.5 billion biotech budget to biomedical research—and because of the high value-added nature of medical products. Over 100 biotech-derived drugs and vaccines are in research and testing, according to the Pharmaceutical Manufacturers Association. The major categories are treatments for cancer, AIDS, and cardiovascular diseases; and vaccines for diseases such as AIDS and malaria. Products nearing the market in the United States include beta and gamma interferons; colony stimulating factors to treat depressed white cell counts associated with AIDS, chemotherapy, burns, or cancers; and blood clotting factors to treat hemophilia.

Diagnostics are one of the fastest growing applications of biotechnology. Recent breakthroughs in amplifying minute amounts of genetic material into larger quantities that can be analyzed is revolutionizing the speed and accuracy of testing. A new technique for producing monoclonal antibodies will make more varieties available for research at lower cost, and provide MAbs more compatible with the human immune system. Most MAbs are used in *in vitro* (test tube) diagnostic tests, but industry is also developing MAbs for *in vivo* (inside the body) imaging to detect cancers, and therapeutic MAbs linked to toxins as drug delivery agents. Researchers are also trying to determine whether MAbs can predict the remission, relapse, and outcome of drug therapies in cancer patients.

Animals

The same biomedical techniques are also being applied to animal health care. Veterinary products now being developed include diagnostic tests, vaccines (rabies, mastitis, and rinderpest), drugs (alpha interferon for treating shipping fever in cattle), and drug delivery systems.

Biotechnology is being used to identify genes in livestock animals for such desired traits as improved disease resistance, faster growth, and better quality meat (lower fat, lower cholesterol) for selective breeding. Efforts to transplant such genes into livestock are in the early stages. But biotechnology is providing a faster route to developing improved livestock over traditional breeding methods. Animal breeding techniques such as embryo multiplication and transfer will speed production of high-quality animals. One of the most promising developments is transgenic chickens that possess an inheritable resistance to avian leukosis virus, a disease that costs U.S. egg producers $50-100 million a year. Companies are developing transgenic animals to mass produce milk out of which proteins are extracted for use in drugs.

In aquaculture, work is underway to enhance the size and growth rate of fish, and to transfer genes among fish species to promote resistance to diseases, pollution, and temperature changes.

Plants

In plant agriculture, biotechnology is providing tools to develop crops with better resistance to pests, diseases, herbicides, pesticides, and environmental stresses, and to improve their nutritional content. New varieties of fruits and vegetables will offer enhanced flavors and such improved commercial characteristics as higher solids content and controlled ripening. Plants have been engineered to mass produce such commercially valuable substances as drugs and melanin for use in sunscreens. Other commercial targets are diagnostics for plant diseases, new varieties of ornamental flowers, and more nutritous oilseeds.

Although small-scale field tests have been successful on agriculturally useful micro-organisms to increase nitrogen intake by plants, inhibit frost damage in crops, and kill pests, and although there is increasing pressure to substitute biological fertilizers and pesticides for chemical ones, an uncertain regulatory environment and limited market prospects have dampened investment in genetically engineered micro-organisms. Killed genetically engineered micro-organisms or those used in containers are having an easier time getting approval.

Food Processing

In food processing, genetic and protein engineering are expected to yield many improved enzymes, amino acids, starter cultures for fermented foods, vitamins, flavoring and food coloring agents, thickeners, emulsifiers, and vegetable oils. Products nearing the market are thaumatin (a sweetener), vitamin C, glucose isomerase (an enzyme used to make high fructose corn syrup), alpha-amylase (an enzyme used in wet corn milling), low-calorie beer, and various food flavors. Faster, more accurate diagnostic tests to detect bacterial contamination and pesticide residues are another important area of research.

New Materials

In materials science, research has already yielded a superadhesive derived from a mussel that will be tested in medical and dental surgery. Other important research areas include biodegradable plastics, high-tensile strength fibers, anticorrosive coatings for marine vessels, and cellulosic fibers for a variety of industrial processes.

Biosensors

Biosensors—devices that combine biological and electrical components—are in the early development stages. Because they can provide highly specific detection, real-time feedback, and control of targeted substances, biosensors show promise for medical diagnostic testing; for *in situ* drug delivery; and for monitoring industrial processes, toxins, and pollutants in air, water, and soil.

Bioremediation and Natural Resources

One of the most important potential applications of biotechnology is the use of micro-organisms to clean up hazardous wastes. With recent successes in using micro-organisms to clean toxic waste dumps and oil spills, and with the high cost of conventional incineration and landfill methods, funding in bioremediation is growing rapidly. Use is limited to selectively-bred natural organisms, however. The uncertain regulatory environment and concerns about adverse public reaction are major deterrents to developing recombinant organisms, which will be needed to attack less easily-degradable contaminants such as PCBs. Genetically-engineered enzymes capable of degrading lignin without using chlorine are being developed, which will reduce pollution in the pulp and paper industry.

In energy, promising developments include a microbial strain which provides an economic method of removing sulphur from coal, and improved microbial strains for enhanced oil recovery and metal and mineral mining. Research on biomass conversion to produce commodity chemicals and fuels may pick up if high energy prices are sustained.

Commercialization

Commercial application of biotechnology depends on public and private funding of basic and applied research. More research is needed on the genetic makeup, structure, and metabolism of industrially useful micro-organisms, plants, and animals, including those from marine environments. The potential of protein engineering, for example, is limited by the lack of predictive models that can show the relationship between the structure and function of proteins. Although researchers have identified and produced genes of interest, more work is needed in large-scale production, monitoring, separation, and purification technology; in bioreactor design; in biosensors; in enzymology; and in drug delivery. These activities will determine product cost, quality, and competitiveness. The most significant problem for biotech companies is access to affordable capital to fund final development and regulatory approval for the many worthwhile products.

Both large and small companies have shied away from applications involving release of genetically engineered organisms out of doors because of public concerns and an uncertain regulatory environment. Future regulations will depend upon Government's gaining more experience and knowledge about the risks posed by genetically engineered organisms. Some states are passing laws which add new layers of regulations to the complex Federal system.

Other factors that influence the commercial use of biotechnology are the political and socio-economic impact of a new product on employment and price levels (e.g., the impact of bovine growth hormone on the dairy industry). The public's concerns about the safeness of genetically engineered foods and products used in the environment will continue to influence government regulatory attitudes and sales.

The ability to obtain prompt patent protection to enforce intellectual property rights is especially important to small companies that rely on revenues from technology licensing. The United States offers the most comprehensive patent protection in the world for biotechnology inventions; micro-organisms, plants, and animals are patentable, provided they meet the criteria for novelty, inventiveness and practical application, and disclosure. The Government is attempting to gain greater international protection for biotechnology inventions, to harmonize patenting procedures with Europe and Japan, and to reduce the backlog of patent applications.

Lack of affordable product liability insurance will create obstacles to commercialization as biotech firms develop such products as drugs, vaccines, and chemicals that traditionally have been subject to greater product liability risks. Insurers are uncertain as well about the risks and liability of insuring genetically engineered organisms used in the environment.

Outlook for 1991

The market value of products developed through genetic engineering and monoclonal antibody techniques could reach $2.5 billion in 1991. Most of that will be derived from health care products. Several new human health care products could be approved this year, including the first MAbs for *in vivo* imaging to detect damaged heart muscle and various cancers, therapeutic MAbs with toxins attached to treat septic shock or prevent transplant rejections, and granulocyte colony stimulating factor to alleviate the effects of cancer chemotherapy. Previously approved products may be cleared for new uses, such as alpha interferon to treat AIDS and erythropoeitin to treat anemic conditions.

Bovine somatotrophin (BST), a growth hormone that increases milk production, is expected to be approved by the FDA in 1991. Although the FDA has determined that milk from herds treated with BST is safe for human consumption, negative consumer perceptions may affect sales. Another growth hormone, porcine somatotrophin (PST), which promotes faster growth in animals with lower fat content, could be approved in 1992. In animal health care, a safer recombinant DNA-derived feline leukemia vaccine should soon be on the market.

Long-Term Prospects

The large number of industries involved in biotechnology, the lack of data, competitive factors, and technical hurdles to new product development make it difficult to predict long-term market values. Based on the large number of promising products in the R&D pipeline, however, market values could be in the $4 to $5 billion range by 1995 and several tens of billions of dollars by the early 21st century. Human health care products will dominate the market, followed by products for animal and plant agriculture. Other industry categories are not likely to be significant for the next 5 to 10 years. Biotechnology will also contribute directly to a greater understanding of the molecular biology of cells and the origin and biochemical pathways of diseases. Research to decipher the human genetic code will play an important role in increasing our knowledge of the biochemistry of life. This knowledge will stimulate the design of new drugs to prevent or intervene in disease progression, the development of new drug delivery devices, and the discovery of new therapeutic substances.

Of the dozen drugs in the late approval stage, several will have a multiplicity of uses and could eventually reach $1 billion in worldwide sales. Market values will depend on effectiveness, safety, competition, price reimbursement limits set by Medicare, and the number and timing of approved uses. Diagnostic tests using monoclonal antibodies and DNA probes will gain an increasing share of the medical testing market.

Market values outside human health care will be much lower because industry is investing less and the economic constraints are more severe. In animal healthcare and agriculture, sales of vaccines, growth promoters, and improved animal feeds may account for several hundred million dollars in sales by the mid-1990s. Genetically engineered plants with improved resistance to herbicides or pests, fruits and vegetables engineered to ripen on the vine and stay fresh longer, and agriculturally useful micro-organisms should be on the market within the five years if they demonstrate price-performance advantages. Public acceptance and the regulatory environment will influence investment in genetically engineered plants, micro-organisms, animals, and foods.—*Emily Arakaki, Basic Industries, (202) 377-3888, August 1990.*

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ADVANCED CERAMICS

Ceramics are nonmetallic, inorganic solids traditionally identified with pottery, electrical porcelain, and plumbing fixtures. Advanced ceramics are made by consolidating pure microscopic powders at high temperatures. Based on oxides, nitrides, and carbides of silicon, aluminum, titanium, and zirconium, these products can be used in environments too demanding for traditional metals, plastics, or conventional ceramics.

Recent advances in processing technologies have led to new structural, electronic, and coating applications. Yield must improve and processing must become cost-effective, however, before advanced ceramics products can be commercialized. Research to develop dependable ceramics materials for demanding applications has focused on environmental behavior and reliability. Ceramic matrix composites (CMC) offer an option for overcoming brittleness. CMCs are formed when ceramic whiskers and fibers are added to a matrix material such as metal or glass to generate a composite less vulnerable to fracture.

Electronic Ceramics

Advanced ceramics electronics applications include semiconductor packages, multilayer capacitors, and superconductors. Advanced ceramics materials are desirable for their noncorrosive and nonmagnetic properties.

Ceramic packaging in electronics is vitally important to the U.S. defense and electronics industries. The United States consumes more than 60 percent of the world's supply of integrated circuity (IC), but there are few U.S. producers. Japanese firms supply 90 percent of all IC packaging materials directly or through their U.S. subsidiaries.

The worldwide electronic ceramics market in 1987 was estimated at $2.2 billion, of which 98 percent, or $2.15 billion, represented packaging materials. Military applications account for approximately 45 percent of the current U.S. consumption.

Structural Ceramics

Structural ceramics are used in making pressure and gas sensors, catalytic converters, heat exchangers, military armor, seals, nozzles, cutting tools, engine turbines, bioceramics (hip joints, teeth), and gear valves. Advanced ceramics may become the material of choice in the automotive industry. Automotive engines made with ceramic components will decrease emissions of hydrocarbons. Concerns about global climate may hasten the commercialization of advanced ceramics.

Military and spacecraft R&D has produced armor, nozzles, and ceramic tiles—products with commercial potential for applications in aerospace, electronics, and medical equipment industries.

Industry estimates that advanced ceramics for structural applications will grow 6 percent a year worldwide for the next five years. The automotive market now accounts for 60 percent of current structural ceramic sales; industrial, 25 percent; aerospace, 10 percent; and bioceramics and cutting tools, 5 percent.

Ceramic Coatings

Ceramic coatings protect or lubricate such substrate materials as metals and cerments. These coatings prevent shutdowns, component failure, and excessive wear and tear in corrosive environments. Automotive producers are testing ceramic-coated parts in engines. The United States has the lead in ceramics coatings technology and applications. Compared to electronics and structural applications, ceramic coatings are the fastest growing segment of the advanced ceramics industry, with an expected annual growth rate of 9 percent for the next 5 years.

Long-Term Prospects

International trade in value-added components made of advanced ceramics will increase over the long term. Major trade issues will be international patent protection and U.S. export controls that restrict trade in advanced ceramics products.

Industry growth overall is estimated at 9 percent a year, with Asia as the leading producer. Electronic ceramics, where Asia is strongest, now accounts for 70 percent of all sales. Structural ceramics are 18 percent of all sales, with coatings, 12 percent.

With the demise of the Cold War, the development of ceramics processing technologies, materials, and products will be geared increasingly toward commercial markets, hastening acceptance of advanced ceramics as a material of choice.—*Moira M. Shea, Office of Chemicals and Allied Products, (202) 377-0128, August 1990.*

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ENGINEERING PLASTICS

Engineering plastics represent a small percentage of the overall plastics industry (SIC 2821). They include polyacetal, polycarbonate, fluoropolymers, polymide, alloys, and blends. Their volume, cost, and market applications are the factors which differentiate them from commodity plastics. With low volume applications they command a high dollar return, representing the cost of R&D and engineering services. Industry shipments in the last 5 years have grown 5 percent for some resins, up to 14 percent for others. Annual growth over the next 5 years is expected to be 9 to 12 percent.

Engineering plastics continue to enjoy a healthy growth rate, boosted by new applications in the electronics and automotive industries. As design engineers come to appreciate the lightness of engineering plastics and realize that the high performance offsets their higher cost, growth will occur in markets where easy moldability and resistance to heat and chemicals are key demands.

The three fastest-growing engineering plastics are polyketones, liquid crystal polymers (LCPs), and polyphenylene sulfide (PPS). Their growth rates have attracted more competitors to the marketplace, leading to competition among different plastics. Many end users tend to downgrade their plastic of choice once a certain compound has proved unnecessarily strong.

The United States is expected to continue as a leader in engineering plastics, although competition from Europe is keen. There will be more acquisitions, mergers, and licensing agreements as a result of EC92, the merger of 12 Western European countries, which will constitute a single market of 325 million people with a Gross Domestic Product of $4.5 trillion and a per capita income of over $13,770. Although the EC will not be fully operational until 1992, EC companies are already gearing up for competition in other world markets.

The Japanese are expected to become a major player in the next five years; increased competition will result in fewer multinational players with the smaller companies being knocked out.

Future international competitiveness for U. S. companies depends on antitrust regulations, and regulations relating to the environment and for work and safety. If mergers are disallowed, companies may cut back expensive R&D. Excise taxes for Superfund and the Clean Air Act (the latter now being renegotiated) will also affect U.S. companies, as discussed in chapter 12, Chemicals and Allied Products. Europe has such taxes, but they are not as high.

Long-Term Prospects

The industry estimates that the overall world growth rate should be 5 to 6 percent a year, with U.S. market growth at 5.2 percent, the European at 5.5, and the Japanese at 5.8 percent.—*Moira M. Shea, Office of Chemicals and Allied Products, (202) 377-0128, August 1990.*

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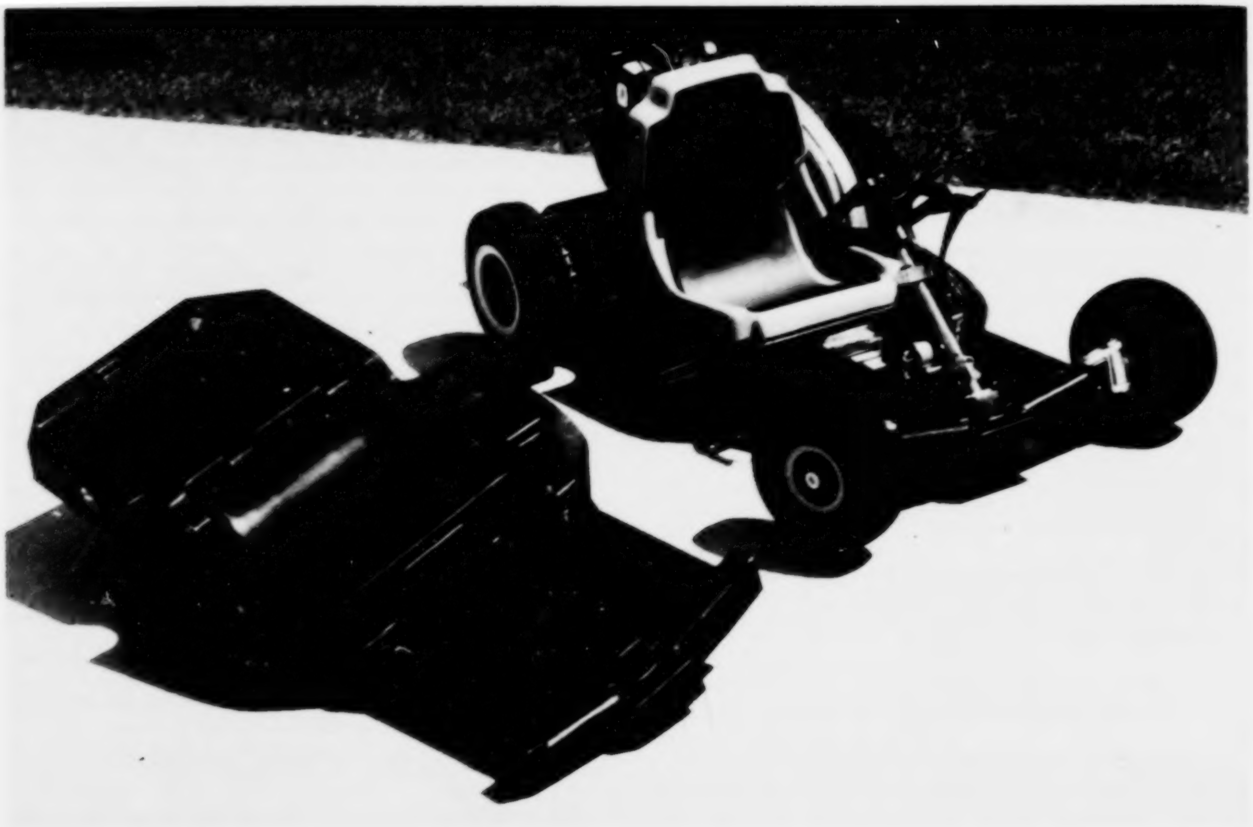
FIBER COMPOSITES

Fiber composites are used in aerospace, sports equipment, automotive and industrial products, and military applications. Carbon fiber, derived from polyacrylonitrile (PAN), is the most widely used advanced fiber composite. It is used extensively in aircraft wings and struts, adding strength and eliminating weight, to make jets faster and more maneuverable. The greatest demand for carbon fiber composites in the foreseeable future will continue to come from the aerospace industry.

Consumption of advanced composites in recent years has been growing at an estimated annual rate of 20 percent. Major areas of application are aerospace (70 percent), industrial and automotive (20 percent), and sports equipment (10 percent).

The United States is the largest producer and consumer of advanced fiber composites. However, Western Europe (particularly France) and Japan also have large industries and together account for about one third of the total value of composite structures produced worldwide. The European market is less than half the size of the U.S. market and is similar in its emphasis on aerospace applications. Japan ranks a distant third in overall production; its fiber composite industry is oriented toward the recreational market. The Japanese have been very active in the development of advanced petroleum pitch technology and could have the lead in developing this process. Two U.S. suppliers now produce pitch-based fibers.

The other important advanced fiber composite is aramid fiber, for which DuPont holds the patent. Aramid fibers are used for tires, bullet-proof vests, helmets, and similar products. For more detailed information on fiber composites, please see the *1990 U.S. Industrial Outlook*, chapter 20, Advanced Materials.



ADZEL Inc

The light, durable chassis of this minicar is molded on standard metal stamping equipment requiring only minor tool modifications. The United States has the world's largest fiber composite industry, and will remain competitive for years.

Long-Term Prospects

The civilian aerospace industry is the key industry fueling the steady growth that is projected for advanced composites in the years ahead. Demand for military aircraft will remain important but is not expected to grow as fast as in past years, due to the anticipated curtailment of some defense programs. Healthy growth in advanced composites will depend on reducing the material unit cost and improving fabricating technology for making parts in a cost-effective way.

The largest volume opportunity for advanced composites is in the automobile industry. In the late 1980s, advanced composites were in limited production for use in body panels, drive shafts, and leaf springs. By the late 1990s, however, unibody structures made with these materials could be introduced on a mass production basis. Additional near-term market applications include medical implants, reciprocating industrial machinery, military vehicles and weapons, and containers for storing and transporting corrosive chemicals.

There is little overall statistical data on the industry or on product development since companies spend hundreds of millions of dollars on R&D—some of that under contracts with the military—and they guard their secrets closely. Department of Defense contracts calling for the use of PAN carbon fiber require a minimum of 50 percent of the composite to be procured from domestic sources by 1992. This requirement plays a part in expectations that the industry will continue to grow in the next 5 to 10 years at 15 to 20 percent—or more if Congress does not cut the military budget.

INTERNATIONAL COMPETITIVENESS

The United States has the largest carbon fiber industry and is also the largest consumer of carbon fiber, since it is the largest producer of aerospace products. The United States will remain competitive for years to come.

While the United States is expected to maintain its worldwide lead in carbon fiber design and production, it will also need to continue developing pitch-based carbon fibers for their potential in cost-effective applications.—*James J. Manion, Office of Metals, Minerals, and Commodities, (202) 377-5157, August 1990.*

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METAL MATRIX COMPOSITES

Metal matrix composites (MMCs) are metals and metal alloys reinforced with fibers, whiskers, particulates, and wires. The physical properties—wear resistance, high stiffness and strength-to-density ratios, high temperature capabilities, a low coefficient of thermal expansion, no moisture absorption, and high electrical and thermal conductivity—make them superior to both monolithic metals and polymer composities in many applications.

MMCs cost more than monolithic metals and are therefore used only in such high-performance applications as military products and aerospace. The tubular members of the space shuttle fuselage trusses, for example, are made from boron-reinforced aluminum.

MMC production has not reached commercial levels because MMCs cost more than conventional materials. The few market niches are in Lockheed electrical equipment racks and Toyota diesel engine pistons, because the materials are more wear-resistant and stronger at high temperatures than the materials they replaced. Manufacturers of such athletic equipment as tennis rackets, skis, and golf clubs are capitalizing on MMCs high strength-to-weight ratio, typically demanding silicon carbide/aluminum and graphite/aluminum.

The absence of sufficient performance and engineering data and of industry standards also inhibits increased commercial use of MMCs. These deficiencies increase design and manufacturing costs for new product development.

The lack of a commercial market, coupled with technical impediments, has created a Catch-22 situation for further development of MMCs. Companies are unwilling to invest capital in production facilities until they have an assured market, but such a market is unlikely until new facilities can meet demand at reasonable prices. Most companies pursing MMC development are small and undercapitalized and have limited technical resources. As a result, the development of these products depends on Department of Defense funding first for research and then to purchase the resulting products.

Long-Term Prospects

Market projections for MMCs vary widely. U.S. sales in the mid-1990s may range from insignificant to $100 million a year, depending on whether any mass commercial manufacturers, such as automotive or bicycle, incorporates these materials in their products.

Commercial use in the United States in the next five years is not likely to expand beyond current applications, including use of fiber MMCs in aircraft and aerospace production. Foreign companies use less expensive particulate and whisker-reinforced MMCs, and so have expanded into commercial markets. Toyota is the biggest foreign user. Foreign commercial use in the next five years is expected to reach $2 billion.

Turbine engines are a likely future application for MMCs. Their light weight and high temperature capabilities will significantly increase engine performance. MMCs may also be the key to the National Aerospace Plane now being developed by NASA. High temperature resistant, lightweight materials will allow this plane to accelerate into earth orbit.

Commercial sector opportunities for MMC are almost entirely in the automotive sector. One of the first large-scale plants offering products that can compete commercially with conventional aluminum alloys is a facility in Quebec, which works in conjunction with U.S. companies. Most of its annual output of 25 million pounds of silicon carbide/aluminum MMC will go to the automotive sector. The material is expected to cost $2 to $3 per pound. MMCs with military applications are manufactured in the United States—*David A. Cammarota, Office of Metals, Minerals, and Commodities, (202) 377-0575, August 1990.*

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POWDER METALLURGY

Powder metallurgy (P/M) is a method of forming precision metal components. P/M permits the fabrication of metal into complex shapes with little or no machining, provides a high degree of control over surface finishes and dimensional tolerances, and cuts down on scrap losses relative to other kinds of metal working. P/M provided breakthroughs in the use of tungsten carbide and in the production of self-lubricating ball bearings.

The U.S. P/M industry is composed of about 50 producers of metal powder and 140 manufacturers of parts and other P/M products. Annual sales of metal powder are approximately $1 billion; sales of P/M parts and other P/M products are around $2.5 billion. P/M products are used widely in lock hardware, lawn and garden equipment, appliances, power tools, sporting goods, and paint and chemicals, but automotive applications are by far the largest end use, accounting for between 65 to 70 percent of total shipments. During 1990, major automakers announced tentative plans to increase their use of P/M parts in engines and other components. Over the years, advances in automotive technology have generated new uses for P/M. Currently, the average U.S. built car contains approximately 24 pounds of P/M parts, up from approximately 10 pounds 10 years ago. By the year 2,000, some U.S. built

Table 2: U.S. Metal Powder Shipments

(metric tons)

Item	1988	1989	1990[1]	1991[2]	Perce 1989-90
Iron and steel	195,954	179,897	174,140	171,180	−3.2
Stainless steel	2,994	3,084	3,186	3,186	3.3
Copper and copper Base	19,958	18,416	17,790	17,061	−3.4
Aluminum	26,309	30,391	29,783	29,188	−2.0
Molybdenum	1,814	1,814	1,814	1,814	0.0
Tungsten	2,177	1,905	1,987	2,003	4.3
Tungsten carbide	4,717	4,808	5,000	5,095	4.0
Nickel	9,798	9,253	9,568	9,568	3.4
Tin	998	907	816	781	−10.0
TOTAL	264,719	250,475	244,084	239,876	−2.6

[1] Estimate.
[2] Forecast.

SOURCE: U.S. Department of Commerce: Bureau of the Census, Int
Administration (ITA); and the Metal Powder Industry Federation.

cars could contain as much as 40 pounds of P/M parts, according to some estimates.

In 1990 the Center for P/M Technology, an industry consortium, was approved to receive Federal R&D funds under the U.S. Navy's MANTECH program. Improving powder- and parts-making processes, and developing materials for more demanding applications, are among the R&D goals of this industry.—*Brian Duggan, Office of Metals, Minerals, and Commodities, (202) 377-0575. August, 1990.*

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Metalworking Equipment

Metalworking shipments will only creep forward in 1991, but prospects are bright for the next five years.

While the nominal value of metalworking equipment shipments increased in 1990, after adjusting for inflation, shipments declined more than 1 percent. Exports were up 21 percent, while imports fell 7 percent. As a result, the trade imbalance in metalworking machinery declined by nearly $1 billion. Shipments in 1991 are estimated to climb 3 to 4 percent in real terms.

Numerous domestic issues cut across the industries that make up the metalworking sector, including an impending shortage of skilled labor, the likelihood of a recession, and higher energy prices. Each will affect the metalworking industries differently, however. For example, the machine tool and power hand tool industry will benefit from a skilled labor shortage as manufacturers move further toward automation and home-owners tackle more do-it-yourself projects to offset higher remodeling costs. On the other hand, the skilled labor shortage is certain to have an adverse effect on contract shops, where labor supplies are critical and competition for labor is intense.

The industry's success depends on the ability of U.S. firms to adapt to global operations without diminishing service to their local customers. This is becoming a critical issue, as the U.S. has fallen from its position as the dominant metalworking market in the 1960s to third or fourth largest.

Before reading this chapter, please see "How to Get the Most Out of This Book" on page 1. It will clarify questions you may have concerning data collection procedures, factors affecting trade data, forecasting methodology, the use of constant dollars, the difference between industry and product data, sources and references, and the Standard Industrial Classification system (SIC). For other topics related to this chapter, see chapters 18 (Advanced Materials), 20 (Industrial Machinery), 22 (Aerospace), and 37 (Motor Vehicles and Parts).

INTERNATIONAL COMPETITIVENESS

The approaching economic integration of 12 Western European nations, or EC92, presents increased opportunities and greater competition for U.S. metalworking equipment manufacturers. Many, if not most, U.S. manufacturers have some type of marketing or production agreement with a European concern. EC92 will allow European joint ventures to operate more freely across most of Europe. In addition, most European experts on the metalworking industry believe EC92 will result in a consolidation not only of markets but of the industry itself. As the market players become more familiar to competitors and customers, smaller national-oriented firms will find it more difficult to remain viable. Mergers, acquisitions, and failures will concentrate production capabilities in Europe among a smaller number of producers, creating stiffer competition for U.S. firms in Europe, third country markets, and in the United States itself. Already, companies such as Maho, ABB, and Trumpf, to name a few, have invested heavily in American production and research facilities. Such investments are expected to continue as European firms expand to remain competitive.

Japan, which is one of the largest consumers of metalworking equipment, imports only a small portion of its total demand. Growth in Japan's economy is expected to maintain its 4-percent pace into 1991 and possibly 1992. Metalworking machinery producers there are already working near capacity; and yet the backlog of orders continues to rise. Although it may be unrelated, last year U.S. metalworking imports from Japan were down more than 30 percent from 1989 levels. Japanese analysts project new machine tool orders to increase marginally in 1991. However, shipments are not projected to increase by the same rate, hence backlogs will continue to grow in 1991. Concurrently, the relative price of U.S. machines has fallen by nearly 10 percent against Japanese machines because of the lower value of the dollar. While business is booming in Japan, Japanese firms have invested heavily in the U.S. during the past three years. Investments have varied and cut across all metalworking equipment industries.

U.S. Exports and Imports
Selected Metalworking Machinery
(in millions of dollars except as noted)

					Percent Change	
SIC	Industry	1989	1990[1]	1991[2]	1989-90	1990-91
3541,2	Machine tools					
	Value of exports	1,631	1,920	2,093	17.7	9.0
	Value of imports	3,019	2,661	2,771	−11.9	4.1
3544	Special dies, tools, jigs & fixtures					
	Value of exports	457	746	805	63.2	7.9
	Value of imports	953	1,065	1,006	11.8	−5.5
3546	Power-driven handtools					
	Value of exports	516	554	598	7.4	7.9
	Value of imports	830	807	845	−2.8	4.7
3548	Welding apparatus					
	Value of exports	450	470	540	4.4	14.9
	Value of imports	480	368	394	−23.3	7.1
Selected Metalworking Machinery						
	Value of exports	3,054	3,690	4,036	20.8	9.4
	Value of imports	5,282	4,901	5,016	−7.2	2.3

[1] Estimate.

[2] Forecast.

SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA). Estimates and forecasts by ITA.

Competition will continue to increase in the next five years as the pace of expansion slows in industrialized economies and some slip into mild recessions. The metalworking firms in Europe and Japan, like their U.S. counterparts, will be looking at newly developed and developing markets for orders to offset declining sales at home. Topping the list of markets is South Korea. From almost total obscurity in 1984, South Korea has become one of the six largest export markets for U.S. metalworking equipment. In some sectors, South Korea has risen to become the second (welding) or third largest (machine tools) export market for U.S. firms. South Korea's gross domestic product is projected to grow by 5 to 7 percent during the next several years, far above the rate of the industrialized nations. Developing markets for U.S. metalworking equipment include Eastern Europe, the Soviet Union, Thailand, and Brazil. Exports of metalworking equipment to the Soviet Union rose sharply in 1990, a trend that is expected to continue into 1991. Brazil has been a fair market for U.S. equipment in the past, but the country's recent economic reforms expanded the market potential dramatically in 1990.

U.S. Trade Patterns in 1989
Selected Metalworking Machinery
SIC 3541, 3542, 3544, 3546, 3548
(in millions of dollars, percent)

Exports			Imports		
	Value	Share		Value	Share
Canada & Mexico	859	28.1	Canada & Mexico	568	10.8
South America	185	6.1	South America	20.1	0.4
European Community	645	21.1	European Community	1,000	18.9
East Asia NICs	473	15.5	East Asia NICs	405	7.7
Japan	241	7.9	Japan	2,628	49.7
Other	650	21.3	Other	662	12.5
World Total	3,054	100.0	World Total	5,282	100.0
Top Five Countries					
	Value	Share		Value	Share
Canada	537	17.6	Japan	2,628	49.7
Mexico	322	10.5	West Germany	653	12.4
United Kingdom	268	8.8	Canada	486	9.2
Japan	241	7.9	Taiwan	260	4.9
West Germany	204	6.7	Switzerland	232	4.4

See "How to Get the Most Out of This Book" for definitions of the Country Groupings.

SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA).

Still, the top four U.S. metalworking export markets (Canada, Mexico, Germany, and the United Kingdom) accounted for 50 percent of total metalworking exports, up from 41 percent in 1989. Canada imported $1,080 million of U.S. metalworking equipment, or 26 percent of the total exports. Mexico purchased $311 million of U.S. metalworking exports, about 8 percent of the total. Exports were up 16 percent in 1990 and are expected to be up 10 percent in 1991. Imports were down 8 percent in 1990 but are expected to increase 4 percent in 1991.

MACHINE TOOLS

Following a 6 percent real increase during 1990, the constant-dollar value of machine tool product shipments will grow an additional 5 percent in 1991. Structural changes in end-user markets will ensure growth of 3 percent a year during the next five years.

The machine tool industry is composed of two four-digit Standard Industrial Classification (SIC) code industries:

Trends and Forecasts: Machine Tools (SIC 3541, 3542)
(in millions of dollars except as noted)

						Percent Change			
Item	1987	1988[1]	1989[2]	1990[2]	1991[3]	1987-88	1988-89	1989-90	1990-91
Industry Data									
Value of shipments[4]	4,586	4,949	6,170	6,788	7,441	7.9	24.7	10.0	9.6
3541 Metal cutting machines	3,190	3,199	—	—	—	0.3	—	—	—
3542 Metal forming machines	1,396	1,750	—	—	—	25.4	—	—	—
Value of shipments (1987$)	4,586	4,781	5,670	5,970	6,269	4.3	18.6	5.3	5.0
3541 Metal cutting machines	3,190	3,078	—	—	—	−3.5	—	—	—
3542 Metal forming machines	1,396	1,703	—	—	—	22.0	—	—	—
Total employment (000)	45.5	45.3	48.8	47.5	48.0	−0.4	7.7	−2.7	1.1
3541 Metal cutting machines	31.7	30.6	33.2	31.9	—	−3.5	8.5	−3.9	—
3542 Metal forming machines	13.8	14.7	15.6	15.6	—	6.5	6.1	0.0	—
Production workers (000)	26.9	27.5	30.1	28.6	28.9	2.2	9.5	−5.0	1.0
3541 Metal cutting machines	18.2	18.0	20.0	18.8	—	−1.1	11.1	−6.0	—
3542 Metal forming machines	8.7	9.5	10.1	9.7	—	9.2	6.3	−4.0	—
Average hourly earnings ($)	13.13	13.43	14.10	15.00	—	2.3	5.0	6.4	—
3541 Metal cutting machines	13.16	13.45	—	—	—	2.2	—	—	—
3542 Metal forming machines	13.08	13.40	—	—	—	2.4	—	—	—
Capital expenditures	92.3	103	—	—	—	11.6	—	—	—
3541 Metal cutting machines	61.1	66.8	—	—	—	9.3	—	—	—
3542 Metal forming machines	31.2	36.3	—	—	—	16.3	—	—	—
Product Data									
Value of shipments[5]	3,955	4,382	5,463	6,026	6,605	10.8	24.7	10.3	9.6
3541 Metal cutting machines	2,585	2,644	—	—	—	2.3	—	—	—
3542 Metal forming machines	1,370	1,738	—	—	—	26.9	—	—	—
Value of shipments (1987$)	3,955	4,239	5,021	5,300	5,565	7.2	18.4	5.6	5.0
3541 Metal cutting machines	2,585	2,546	—	—	—	−1.5	—	—	—
3542 Metal forming machines	1,370	1,693	—	—	—	23.6	—	—	—

[1] Advance data from the 1988 Annual Survey of Manufactures.

[2] Estimate.

[3] Forecast.

[4] Value of all products and services sold by establishments in the machine tools industry.

[5] Value of products classified in the machine tools industry produced by all industries.

SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA). Estimates and forecasts by ITA.

the metal cutting machine tool industry (SIC 3541) and the metal forming machine tool industry (SIC 3542). The 1987 Census of Manufactures reported that the two industries were made up of 624 manufacturing establishments (plants) owned by an estimated 570 companies. Based on both employment and establishment data, the machine tool industry is concentrated in the Midwest. However the majority of new foreign investment and U.S.-owned plants were constructed in the South and Southeast.

Although machine tools are the most basic of all manufacturing equipment, the industry itself is very small. Total employment is 72,700, of which 47,400 are production workers. These figures are down significantly from their peak in 1980, when the industry employed 108,000, including 71,700 production workers. Total gross book value for the industry is slightly more than $2 billion. Average sales per firm were less than $6 million and average employment is fewer than 150 workers per firm. Based on shipments, the industry as a whole would rank approximately 125 in the Fortune 500.

Shipments, orders, and exports have been robust during the past three years. According to the U.S. Bureau of Census' *Current Industrial Report* (CIR), machine tool producers shipped $3.9 billion in 1990. Data reported in the CIR represents about 65 percent of all the machine tools produced in the United States and slightly more than 90 percent of the machine tool industry's revenue. CIR implicit order data represented machine tool orders for 1988 of $3.8 billion, up 50 percent from 1987 levels. In 1989, orders fell 15 percent, and 1990 orders also were approximately $3.3 billion. NMTBA, the Association for Manufacturing Technology reports order activity on a monthly basis for new complete machine tools valued at more than $2,500. In 1988, NMTBA found that orders climbed 70 percent, followed by a decline of 21 percent in 1989, and a marginal decline in 1990.

The domestic customer base for the machine tool industry has changed very little in the past three years. The auto industry continues to account for approximately 33 percent of total machine tool orders through direct purchases. This figure is closer to 40 percent if orders by automotive subcontractors are included. Although aerospace remains the second largest buyer of metalworking equipment in the U.S. with a 10 percent share, it has slipped to nearly half its share in the mid-1980s. The construction, mining, and materials handling machinery industry (SIC 353), which now accounts for nearly 10 percent of orders, is expected to move past aerospace in 1991. In general, increased orders from the minor machine tool buying industries have offset declines in auto and aerospace buying. However, foreign buyers are the fastest growing customers for U.S. machine tools.

INTERNATIONAL COMPETITIVENESS

Growth in export shipments has averaged 20 percent over the past three years and in 1990 surpassed $1 billion (in nominal dollars) for the first time. The leading export markets were Canada, Mexico, the United Kingdom, South Korea, and Germany. The five nations accounted for about 55 percent of total U.S. machine tool exports. During 1990, the fast growing export markets were the Soviet Union, Malaysia, Canada, Belgium, and India. A significant portion of the country's exports are centered on grinding machinery, large presses, and "used, rebuilt machinery and/or under $2,500." Exports of these three products areas exceeded $400 million in 1990 and represented 21 percent of all machine tool exports.

After a 17 percent surge in 1989, imports fell by nearly 12 percent in 1990 to $2.6 billion. As a result, import penetration for the industry moved downward to about 42 percent. The largest machine tool exporters to the U.S., accounting for nearly 80 percent of the total in 1990, were Japan, Germany, Taiwan, the United Kingdom, and Italy.

Outlook for 1991

Despite lower capital spending by the auto and aerospace industries, the two will remain the important markets for machine tools during 1991. Higher capital spending by other industries will offset the declines in aerospace and autos. During late 1991 and 1992, the construction, mining and materials handling industry is expected to surpass the aerospace industry as the second largest domestic machine tool consumer behind autos. Machine tool shipments are expected to grow 5 percent in real terms during 1991 and 3 percent in 1992.

Defense spending has typically accounted for 5 to 8 percent of industry orders. Defense spending for machine tools has fallen continuously since 1985, and there is not likely to be a near-term change in the Department of Defense demand for machine tools. If automakers are once again required to meet higher fuel economy standards, it will certainly boost capital spending by the auto industry.

In addition to the cyclical demands of customer industries, domestic machine tool demand is certain to suffer as a result of cyclical factors in the economy. A recession generally results in capital spending cuts. However, the expected downturn in 1991 may be an exception. The domestic and international economies are inundated with unusual structural demands that are likely to result in continued growth in capital equipment shipments.

At the forefront of these issues is a general capacity constraint problem in Japan and Europe. For the first time in recent history, Japanese machine tool builders' backlogs and delivery schedules have equalled those of their U.S. counterparts. The latest Japan Machine Tool Builders' Association press release states that backlog orders are equal to 5.7 months at current shipping rate; the comparable U.S. figure is 5.2 months. Japanese durable goods manufacturers are experiencing a surge in domestic capital spending. Although the growth in spending is expected to slow, the machinery industry's shipments have not stayed abreast of current demands. Further growth will add pressure to industries like the Japanese machine tool industry which are already working at capacity.

The high capital demand in Japan is a result of three factors: increased consumer demand, a declining pool of skilled labor, and new legislation that will reduce the work week from 48 hours to 40 hours by March 1992. Japanese manufacturers are acquiring capital equipment not for capacity expansion but to improve productivity of a declining force. Europe, and particularly Germany, is undergoing a similar but less dramatic experience.

Japanese and European initiatives to automate and invest in the latest technologies are all the more important in the face of increased oil prices. Reduced scrap, energy conservation, and improved quality have become as important to remaining competitive as improving labor productivity. It is in this area that U.S. manufacturers have the biggest disadvantage. Changes in component costs and energy prices have a much greater impact on U.S. production costs than on those of foreign competitors. U.S. firms will necessarily invest in new technologies not only to improve their competitiveness but to ensure their short-term viability. According to *Production* magazine's annual capital spending survey, the percentage of firms that buy machine tools to "improve productivity" rather than to "increase capacity" has increased 10 percent in just the past two years. This may explain why only 18 percent of the respondents plan to decrease capital spending because of an expected decline in manufacturing activity. Based on its survey, *Production* projects a 1 percent increase in capital spending.

Other structural changes that are certain to affect U.S. machine tool demand include environmental legislation and impending changes in the export controls on machine tool and control technology.

Japan's machine tool exports to the U.S. fell by more than the total decline in U.S. imports in 1990. In other words, the Japanese decline in dollar volume represented the entire decline in imports. As two more Japanese-owned plants and several European-owned transplants began full production runs in 1989 and 1990, U.S. shipments of several machine tool products grew significantly. In addition to servicing U.S. demands, this output added to the U.S. trade flow with other American and European nations. Only the German firm, Trumpf, and the Japanese firm, Mazak, have publicized the export portion of their operations, but the volume which the transplants are contributing to U.S. exports certainly exceeds the exports of these two firms. The expansion of transplants has contributed to the decline in import penetration and the marginal improvement in the health of the industry. In the next two years, foreign investment in the machine tool industry is expected to continue at its current pace. Future foreign investment will include more takeovers, mergers, and acquisitions than occurred during the previous three years.

Long-Term Prospects

In real terms, U.S. machine tool shipments are expected to expand by 3 percent a year through the next five years.

An imminent shortage of skilled labor heads the list of issues that will have a significant impact on the U.S. machine tool industry. It will force all of the metalworking industries to invest in more productive manufacturing facilities, including automated production equipment.

The globalization of markets has led to more outsourcing—the production of components in newly industrialized countries. In turn, producers in these industrialized countries have adopted modern technologies to ensure that their products meet the requisite standards of quality. U.S. machine tool producers have found these foreign producers to be lucrative markets. South Korea has been one such market, and Thailand, Indonesia, and Brazil show similar promise.

At home, much depends on the outcome of product liability reform. According to a recent NMTBA survey, approximately 25 percent of the U.S. machine tool manufacturers have no product liability insurance. In some cases producers could not find insurance. Most machine tool firms reported that they could not justify the cost of the insurance. The survey found that settled claims averaged $71,000 and that court awards averaged slightly more than $1 million. For a firm that can not afford or obtain coverage, a single product liability award can mean bankruptcy.—*Patrick W. McGibbon, Office of Capital Goods and International Construction, (202) 377-0314, September 1990.*

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Production, Gardner Publishing, 6600 Clough Pike, Cincinnati, OH 45244. Telephone: (513) 231-8020.

METAL CUTTING TOOLS

Metal cutting tools continued to show respectable growth in 1990, with product shipments up by more than 2 percent in constant 1987 dollars.

Metal cutting tools (SIC 35451) perform the actual cutting on the machine tool and require frequent replacement or re-sharpening. They include mills, reamers, drills, taps, and various forms of indexable inserts.

The rapid growth in new orders and product shipments slowed in 1990 as new orders fell during late 1989 and the first half of 1990. However, given the normal lag in shipments and an improved export performance, current-dollar product shipments were expected to rise by 4 percent in 1990, to $2.44 billion. This came on the heels of a 10 percent rise between 1988 and 1989, to $2.34 billion, that marked the end of a long period of stagnation. In constant 1987 dollars, product shipments reached $2.28 billion, a 2 percent increase over 1989.

INTERNATIONAL COMPETITIVENESS

Rising exports fed the improved performance of the metal cutting tools industry in 1989 and should contribute significantly to the increases that were expected in 1990. With exports expected to rise by 50 percent in 1990 to $272 million, the industry would have a positive trade balance. Canada, at $120 million, or 44 percent of the total, remains the leading U.S. export market. Germany, the number two export destination, accounted for $28 million, or 10 percent of the total. Other leading importers of U.S. cutting tools were Japan, Mexico, and the United Kingdom, each with about 5 percent of the total.

U.S. imports of metal cutting tools rose again in 1990, reaching $246 million, a 32 percent increase over 1989. The increase is deceptive, however, as it followed an unusually steep decline in imports during 1989, when they fell by 36 percent to $187 million. The import volatility was ascribed to changes in exchange rates and the establishment in recent years of several new foreign-owned manufacturing plants in the United States. Cutting tools were imported from many countries. The 1990 import leaders were Japan (30 percent), Germany (13 percent), and Canada (10 percent).

Manufacturers continue to exploit new technologies, such as advanced ceramic cutting tools, despite the high costs involved in fabricating these tools. The industry continues to expand the use of carbide tooling at the expense of high-speed steel.

Outlook for 1991

With cutting tool orders falling through most of 1990, the effects should be felt in 1991. Consequently, product shipments are expected to decline by about 2 percent in constant 1987 dollars, falling to their 1989 level. Exports should show a further increase of 11 percent to $302 million. With imports expected to rise by 14 percent to $280 million, the U.S. trade balance in cutting tools should again be positive in 1991.

Long-Term Prospects

The industry will have a mixed performance during the next five years, posting a 1.5 percent compound annual growth in constant 1987 dollars. Much of the growth for the period will come about through the sale of cutting tools that use new and exotic materials that enhance productivity. The high cost of manufacturing ceramic tools may raise the cost per unit of new cutting tools, while initially cutting overall sales volume until the customer base is fully cognizant of the need for improved tooling. As the technology of more rigid machine design, higher speeds and horsepower are being applied on the shop floor, more highly specialized tooling will be needed.

The industry's trade balance has improved markedly between 1988 and 1991. Although import growth may be slowed by further foreign investment in U.S. facilities, the positive balance will not necessarily continue during the next five years.—*Edward D. Abrahams, Office of Capital Goods and International Construction, (202) 377-0312, September 1990.*

Additional References

(Call the Bureau of the Census at (301) 763-4100 for information about how to order Census documents.)

1987 Census of Manufactures, Metalworking Machinery, MC87-1-35C, U.S. Bureau of the Census, Washington, DC 20233.

Cutting Tool Engineering, CTE Publications, Inc., Northfield, IL 60093. Telephone: (708) 441-7520.

ROBOTICS

The robotics industry is composed of approximately 60 to 70 producers and robotic systems integrators. The value-added products produced in the U.S. are in such robotic accessories as vision systems, sensing and proximity devices, end-of-arm tooling, and motion controllers. Information on the U.S. robotics industry is difficult to obtain because no single Standard Industrial Classification (SIC) code encompasses the industry. Rather, the industry's products are coded by the primary function of the end-product. For example, welding robots are classified in SIC 3548, electric and gas welding and soldering equipment. As a result, there are no Census Bureau data on employment or value added. Shipment, order, and trade data are available through the Bureau of Census' *Current Industrial Report* (CIR) on robotics as well as from the industry association, Robotics Industries Association (RIA).

Orders in 1990 slid 5 percent from the record established in 1989. Based on RIA data, orders booked in 1990 totalled slightly less than $500 million. RIA reported that 25 percent of the total represented international business. Projected data for 1990 show that orders outstripped the $425 million in shipments by $75 million. The net result is that the industry's backlog continued to grow, rising 32 percent to $310 million. At current shipment rates, this represents nine months of shipments.

The Census Bureau's latest available statistics on the domestic robotics industry were reported in the June 1990 Current Industrial Report (CIR) for robots and accessories (MA35X). It reported 1989 shipments of 2,217 complete U.S.-produced robots, with a value of $151 million. This represents an 8 percent decline in unit production and a 3 percent decline in dollar volume. Accessories shipments were valued at $105 million in 1989, up 42 percent from the previous year.

INTERNATIONAL COMPETITIVENESS

Estimated exports of robots and parts for 1990 totalled $100 million, a 61 percent increase over 1989. Complete robots represented $67 million for a total of 6,000 units. That is nearly twice the unit volume exported in 1989. Imports of robots and parts totalled $160 million during 1990, down 30 percent from 1989. Complete robots imported in 1990 represented approximately 24,000 units and $125 million.

Robotic applications are primarily in welding, painting, and material handling. Approximately 20 percent of the robots put in place during 1990 were used in spot welding. Assembly applications accounted for 25 percent of the market, while materials handling and painting accounted for another 40 percent. The remaining applications included inspection, quality control, and personal services. Particularly interesting are the advancements in application research for robotics in the medical and commercial cleaning industries.

Outlook for 1991

In spite of relatively strong orders and a growing backlog, shipments in 1990 did not increase as expected. Orders in 1991 will remain unchanged, but shipments will necessarily advance by more than 15 percent to prevent the backlog of orders from getting out of control. Unless the pace of shipments picks up, domestic customers will seek systems integration from foreign sources and/or cancel orders with U.S. integrators.

The industry's primary customer is the auto industry, which accounts for nearly 50 percent of robotics purchases. Dependent as it is on the capital spending decisions of the auto industry, the robotics industry is subject to volatile cyclical swings. This dependence on the auto industry should lessen, however, because of the robotics industry's success in diversifying its customer base. For example, new orders from the electronics and service industries are helping to offset expected declines in spending by the auto industry.

Structural changes in the labor market are forcing even the auto industry to continue investing in robotics. A labor shortage is forcing metalworking firms to invest in more productive equipment and methods. In numerous instances, consequently, manufacturers are substituting robotics for skilled labor or utilizing robotics to relieve skilled labor from performing mundane functions. Furthermore, strict Occupational Safety and Health Administration (OSHA) standards on workplace hazards will spur demand as more employers substitute robots for employees in hazardous environments.

Long-Term Prospects

The outlook for the robotic market is promising, with shipments expected to grow 7 percent over the next five years.

Despite heavy investment aimed at developing new applications for robotics, the industry is still too dependent on the auto industry. The most promising new applications are in food processing, where some integrators have developed a market for robotic technologies such as materials handling, inspection, and cutting. Other areas of new applications are the marriage of new technologies to robotics, such as waterjet cutting. Advancements in positioning accuracies, mobility, tele-operations, and artificial intelligence will certainly open new markets as they become economically feasible.

Two relatively recent structural changes in the market may also aid in expanding the robotics market in the next five years. One is the shortage of skilled labor discussed earlier. The other is the emergence of a secondary market for robotics. Nearly 37,000 robots have been installed in the U.S. and another 20,000 will be put in place during 1991. Robotics houses are finding that users increasingly seek rebuilding services and second-hand robots. The expansion of the used robotics market and a growing need for rebuilding services will open new markets as first-time buyers experience the benefits of robotics at used prices. Refurbishing of older robots also will provide the robotics industry with a steady source of rebuilding revenues.

The diffusion of robotics technology will eventually create a customer base capable of supporting a viable and competitive industry. With the sale of Cincinnati Milacron's robotics division to ABB of Switzerland, the question is whether there will be a domestic industry to support.—*Patrick W. McGibbon, Office of Capital Goods and International Construction, (202) 377-0314, September 1990.*

Additional References

(Call the Bureau of the Census at (301) 763-4100 for information about how to order Census documents.)

American Machinist, Penton Publishing, 122 E. 42nd Street, New York, NY 10168. Telephone: (212) 867-9191.

Production, Gardner Publishing, 6600 Clough Pike, Cincinnati, OH 45244. Telephone: (513) 231-8020.

Managing Automation, Thomas Publishing Company, 5 Penn Plaza New York, NY 10001. Telephone: (212) 695-0500.

Robotics Industries Association, 900 Victors Way, P.O. Box 3724 Ann Arbor, MI 48106. Telephone: (313) 994-6088.

Robots, Current Industrial Report, Series MA35X, Bureau of Census, Industry Division, U.S. Department of Commerce, Washington, DC 20233.

NUMERICAL CONTROLS

In spite of a significant decline in positioning type numerical control (NC) devices, NC shipments are projected to grow 5 percent in 1991 and 5 percent in 1992, in real terms.

Based on dollar volume, numerical controls represent 4 percent of the relays and industrial controls industry (SIC 3625), under commodity lines 362525 and 362526. Approximately 50 to 60 firms contribute production data to the Census Bureau. They include producers of continuous path controls, digital readout devices (DROs), and positioning-type controls.

Shipments of NC devices peaked at 105,000 units in 1988, but the dollar volume hit a new high of $225 million in 1990. Continuous path controls are the fastest growing segment of NC devices, registering a unit production growth of 33 percent, 25 percent, and 15 percent from 1988 through 1990. Production of digital readout devices is also up, averaging an 18 percent growth rate over the past three years. Production of positioning type devices fell, however, from 55,000 units in 1988 to about 40,000 in 1980.

INTERNATIONAL COMPETITIVENESS

Approximately 16,000 NC devices of all types were imported into the U.S. during 1990. This represented an 18 percent increase over 1989. Dollar volumes were virtually the same, at $53 million. Japan represents 79 percent of NC devices imported during 1989 and shipped an estimated 88 percent of the 1990 NC devices imported. U.S. exports were off significantly in 1990 from the 9,154 units posted in 1989, valued at $41 million. Optimistic estimates for 1990 projected an export total of 3,700 units, with a value of $35 million.

In addition to the NC devices sold separately, the U.S. market for NC machine tools continues to climb.

Outlook for 1991

Continuous path and DRO shipments will continue to outpace the growth in machine tool shipments, but declining use of positioning type NC devices will be a drag on industry shipments. In real terms, NC shipments are projected to grow 5 percent in 1991 and 5 percent in 1992.

Apparent consumption data for NC machine tools continues to account for a larger share of the total machine tool market. In 1984, as the metalworking industries were rebounding from a severe recession, NC equipment as a share of total machine tool consumption was 17 percent of units and 39 percent of value. Based on 1990 apparent consumption data, NC equipment accounted for 25 percent of units and 50 percent of value for the U.S. machine tool market. Although machine tool orders are flat, NC orders' share of the total is growing, and likewise the absolute production levels of NC devices. Other areas where NC devices are used for motion control are experiencing significant growth, too. Robotics industry shipments are expected to expand over the near term, along with woodworking machinery and the use of NC devices on waterjet cutting equipment.

Long-Term Prospects

During the next five years, NC production will grow by an average rate of 5 percent a year in real terms.

Quality and productivity are the key to continued competitiveness of U.S. firms. NC technology has improved the accuracies of machines and permitted skilled machinists to operate multiple units or even multiple cells. U.S. firms must improve the ratio of automated machinery to total equipment stock if the United States is to regain market share lost to foreign industry.

Research and development continues on the "next generation controller" (NGC), both here and abroad. The Japanese have proposed an international research effort on manufacturing technology of which motion control/factory control is a critical item. In mid-1990, the Robotics and Manufacturing Research Laboratory of New York University demonstrated that the NGC may be realized in the near future. In the laboratory, researchers have utilized off-the-shelf components to construct an NC milling machine with an open-architecture computer control. The computer permits much easier integration of information from gauges, feedback systems, and sensors than standard industrial NC devices. Open architecture is passé in the computer industry but a major development in industrial controls.

NC builders have markedly improved their use of recent computer technology into controls. Control builders have already begun to explore open platforms utilizing the most current microprocessors and highest speed chips without major redesigning efforts. Others are exploring the use of reduced instruction set computing (RISC) technology in controls. RISC technology narrows the set of operations of the microprocessor's focus. RISC technology is expected to allow NC machines to take shorter runs on workpieces with improved part quality by eliminating following error. Following error is a discrepancy between what is actually occurring at the point of contact of the tool and metal and what the computer interpolates as occurring.

Advances in control technology and NC equipment's growing share of total equipment sold ensure that NC demand will outpace general industrial equipment demand.—*Patrick W. McGibbon, Office of Capital Goods and International Construction, (202) 377-0314, September 1990.*

Additional References

(Call the Bureau of the Census at (301) 763-4100 for information about how to order Census documents.)

Economic Handbook of the Machine Tool Industry, NMTBA, the Association for Manufacturing Technology, 7901 Westpark Drive, McLean, VA 22102. Telephone: (703) 893-2900.

American Machinist, Penton Publishing, 122 E. 42nd Street, New York, NY 10168. Telephone: (212) 867-9191.

Production, Gardner Publishing, 6600 Clough Pike, Cincinnati, OH 45244. Telephone: (513) 231-8010.

Managing Automation, Thomas Publishing Company, 5 Penn Plaza New York, NY 10001. Telephone: (212) 695-0500.

Switchgear, switchboard apparatus, relays and industrial controls, Series MA36A, Bureau of the Census.

TOOLS, DIES, JIGS, FIXTURES, MOLDS AND CONTRACT MACHINING

Following a 4 percent real decline in 1990, business activity in this area will grow at a real rate of 4 percent in 1991 and 1992.

The grouping includes firms in special dies and tools, die sets, jigs and fixtures, industrial molds industry (SIC 3544) and "receipts for machine shop job work" (35995) included in Industrial Machinery, not elsewhere classified (SIC 3599). SIC 3544 includes contract tool and die shops that primarily engage in manufacturing on a job or order basis, special tools and fixtures for use with machine tools, hammers, die-casting machines, and presses. Firms that produce molds for working rubber, plastic, metal, and glass, and firms that produce special machines also are included in this industry. The Bureau of Census' *1987 Census of Manufactures* states that there are 7,207 establishments in SIC 3544, with only 1,517 having more than 20 employees. An estimate of actual number of contract shops, including those that classify themselves within their major customer industry, places the industry at 14,000 firms.

Estimated product revenues for SIC 3544 and SIC 35995 show that 55 percent of 1990 shipments were derived from contract machining. Special tooling (other than molds) amounted to 30 percent of the industry's revenues and producing molds accounted for the remaining 15 percent. Following a modest increase during 1989, shipments moved downward 5 percent in 1990 to $19 billion.

INTERNATIONAL COMPETITIVENESS

Exports of molds climbed 10 percent from $419 million in 1989, to $460 million in 1990. Exports of dies rose 12 percent, from $81 million to $91 million in 1990. Only exports of jigs and fixtures fell, by 23 percent in 1990 to $32 million.

Imports of special tools and dies were down significantly in 1990. Estimated mold imports in 1990 were $480 million, down 3 percent. Although imports from Canada climbed 10 percent, imports of molds from Japan declined by about 33 percent. The import of dies and special tools dropped nearly 38 percent in 1990 to $208 million. The largest supplier nation was Japan, with nearly $130 million in spite of a 40 percent decline in dollar volume. Canada was the second largest with $40 million, up 60 percent from the previous year.

Outlook for 1991

Inventory corrections among customers caused a 4 percent decline in the tooling and contract shop industry's 1990 revenues. Fortunately, the inventory correction for the materials working industries has run its course and industry shipments for SIC 3544 and SIC 35995 will pick up in

Trends and Forecasts: Special Dies, Tools, Jigs and Fixtures (SIC 3544)

(in millions of dollars except as noted)

						Percent Change			
Item	1987	1988[1]	1989[2]	1990[2]	1991[3]	1987-88	1988-89	1989-90	1990-91
Industry Data									
Value of shipments[4]	7,560	8,078	8,482	8,058	8,749	7.0	5.0	−5.0	8.6
Value of shipments (1987$)	7,560	7,940	8,124	7,386	7,681	5.2	2.3	−9.1	4.0
Total employment (000)	114	116	123	122	122	1.8	6.0	−0.8	0.0
Production workers (000)	87.7	89.7	96.0	95.5	95.5	2.3	7.0	−0.5	0.0
Average hourly earnings ($)	12.14	12.66	13.29	13.96	—	4.3	5.0	5.0	—
Capital expenditures	375	273	—	—	—	−27.2	—	—	—
Product Data									
Value of shipments[5]	8,143	8,564	8,992	8,543	9,276	5.2	5.0	−5.0	8.6
Value of shipments (1987$)	8,143	8,418	8,613	7,830	8,144	3.4	2.3	−9.1	4.0

[1] Advance data from the 1988 Annual Survey of Manufactures.

[2] Estimate.

[3] Forecast.

[4] Value of all products and services sold by establish[illegible] in the special dies, tools, jigs & fixtures industry.

[5] Value of products classified in the special dies, tools, jigs & fixtures industry produced by all industries.

SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA). Estimates and forecasts by ITA.

1991 and 1992. A 4 percent real increase in shipments is projected for both 1991 and 1992.

Industries that registered increased order activity at the end of 1990 include the construction, mining and materials handling industry (SIC 353); motor vehicle parts (SIC 3714); household appliances (SIC 363); and the electronic components industries (SIC 367). Orders placed with firms in SIC 353 were up 7 percent at years' end. The increased activity in SIC 353 will result in additional job work and special tooling orders as the major players in these industries (such as Caterpillar) rationalize production and capacity needs. As a result, reliance on job shops for components, tooling, and special machines will increase. Orders for household appliances are expected to grow by 2 percent during the first half of 1991. In addition, both the electronic components and automotive parts industries are expecting a 2 percent increase in orders through the first quarter of 1991. The impact on the contract shops will be positive but marginal.

The financial pages are replete with stories of an impending recession. However, a recent Bureau of Census report on planned plant and equipment expenditures projects small but positive growth in capital spending. The report states that metalworking firms plan to increase capital spending by 3 percent in 1991. In addition, exports will increase dramatically. Recent statements by National Tooling and Machining Association (NTMA) executives note that the industry is optimistic about the outlook for exports. Efforts to expand the burgeoning export market include an NTMA-sponsored procurement fair with key metalworking executives of Japanese metalworking firms, and plans for a U.S. contract shop trade fair in Europe in 1991.

Long-Term Prospects

Firms producing these products are expected to experience real growth of 3 percent over the next 5 years.

The severe shortage of skilled labor in the metalworking industries is much more severe in these firms within SIC 3544 and SIC 35995, many of which have fewer than 20 employees. In recent years, these smaller firms have managed to outpace larger companies in terms of wages, benefits, and job security. Nevertheless, larger companies have maintained an edge in attracting skilled labor. The industry and NTMA have addressed recruiting and training problems in many NTMA chapters and have made headway against the negative image of a career in machining. Currently, U.S. manufacturers are training only 20 percent of the skilled labor that will be required by 1995. NTMA has supported legislation to change immigration laws to give skilled workers priority.

Exports are playing a more significant role in production schedules and are expected to grow. U.S. contract shops have explored and exploited markets in Europe and Japan. The next step is to increase sales to developing markets in South Korea, Thailand, and South America.—*Patrick W. McGibbon, Office of Capital Goods and International Construction, (202) 377-0314, September 1990.*

Additional References

American Machinist, Penton Publishing, 122 E. 42nd Street, New York, NY 10168. Telephone: (212) 867-9191.

Production, Gardner Publishing, 6600 Clough Pike, Cincinnati, OH 45244. Telephone: (513) 231-8020.

Job Shop Technology, Edwards Publishing Company, P.O. Box 7193, 16 Waterbury Road, Prospect, CT 06712. Telephone: (203) 758-6663.

Modern Machine Shop, Gardner Publications, 6600 Clough Pike, Cincinnati, OH 45244. Telephone: (513) 231-8020.

Tooling & Production, Huebcore Communications, Inc., 29100 Aurora Rd., Suite 200, Solon, OH 44139. Telephone: (216) 248-1125.

The National Tooling and Machining Association, 9300 Livingston Road, Fort Washington, MD 20744. Telephone: (301) 248-6200.

POWER DRIVEN HAND TOOLS

The U.S. power driven hand tool industry faces a period of slow to negative real growth. In constant dollars, product shipments were expected to rise by about 2.5 percent in 1990, continuing a pattern of slowing growth. Between 1987 and 1990, product shipments increased 17 percent in constant dollars, with most of the increase coming between 1987 and 1988. The power tool industry is highly sensitive to changes in new residential construction and the rate of spending for rehabilitating existing housing units. Overall, the near-term performance of the power tool industry hinges on demand for new and existing residential units.

Driven by rising demand for new cordless power tools, current-dollar product shipments were expected to reach $2.44 billion in 1990. In constant 1987 dollars, product shipments were expected to increase by 2.5 percent to $2.21 billion.

INTERNATIONAL COMPETITIVENESS

While the balance of trade in power tools will continue to be negative, imports in 1990 should decline for the first time

Trends and Forecasts: Power-Driven Handtools (SIC 3546)

(in millions of dollars except as noted)

						Percent Change			
Item	1987	1988[1]	1989[2]	1990[2]	1991[3]	1987-88	1988-89	1989-90	1990-91
Industry Data									
Value of shipments[4]	2,162	2,506	2,657	2,791	—	15.9	6.1	5.0	—
Value of shipments (1987$)	2,162	2,441	2,488	2,533	2,558	12.9	1.9	1.8	1.0
Total employment (000)	16.8	17.1	17.8	17.0	—	1.8	4.1	−4.5	—
Production workers (000)	11.7	12.0	12.1	11.2	—	2.6	0.8	−7.4	—
Average hourly earnings ($)	9.97	9.69	—	—	—	−2.8	—	—	—
Capital expenditures	46.2	59.0	—	—	—	27.7	—	—	—
Product Data									
Value of shipments[5]	1,886	2,156	2,304	2,437	—	14.3	6.9	5.8	—
Value of shipments (1987$)	1,886	2,104	2,157	2,211	2,237	11.6	2.5	2.5	1.2

[1] Advance data from the 1988 Annual Survey of Manufactures.

[2] Estimate.

[3] Forecast.

[4] Value of all products and services sold by establishments in the power-driven handtools industry.

[5] Value of products classified in the power-driven handtools industry produced by all industries.

SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA). Estimates and forecasts by ITA.

since the 1982 recession. With domestic demand slowing, imports are expected to drop by about 3 percent, to $807 million in 1990. This trend also reflects increased production in U.S. plants of Japanese and German firms. Export will continue to climb modestly, rising about 7 percent to approximately $554 million.

Although exact figures are unavailable, industry sources estimate that cordless power tools constitute more than 25 percent of the electric tool market, with unit sales increasing by about 10 percent per year. Power tool manufacturers continued to expand their cordless tool offerings in 1990, with several announcing new cordless hammer drills. These firms offer professional tools with easily detachable spare battery packs, which allow the operator to use the tool while it is charging, and solar chargers to permit charging where electrical outlets cannot easily be accessed. As the nickel-cadmium battery cell technology has advanced, applications have been found for more powerful tools, commonly up to 12 volts. Some professional tools have 13.2 and 24 volts of battery power. Both U.S. and Japanese firms are developing nickel hydride storage batteries suitable for use in power tools, with commercialization likely to occur in 1991. Nickel hydride batteries will ease hazardous waste disposal problems caused by nickel-cadmium batteries. Among consumer tools, the cordless power screwdriver remains popular, although industry sources expect shipments to begin leveling off. Introduction of the cordless screwdriver has allowed power tool marketers to reach such new customers as women, apartment dwellers, and others not accustomed to using power tools. Some of these consumers may eventually move up to more sophisticated power tools.

Demand for gasoline-powered chain saws rose by about 4 percent in 1989 to just over 1.4 million units, and was expected to show a similar increase in 1990. Sluggish chain-saw sales for nearly a decade had led the industry to discontinue some lines and encouraged foreign takeover of several U.S.-based suppliers. Furthermore, chain-saw demand is seasonal and unpredictable. An unusually severe number of natural disasters in 1989 and 1990, including tornadoes, hurricane Hugo, and the California earthquake, sent chain-saw sales surging.

Outlook for 1991

Product shipments of power tools should rise by about 1.2 percent in constant dollars during 1991. Product shipments will total about $2.24 billion in constant 1987 dollars, substantially higher than earlier estimates. Gains in product shipments of cordless tools will continue to pace the industry's growth, with chain saws and hammer drills also expected to show advances. Power tool imports are likely to resume their upward climb in 1991, reaching $845 million, a 5 percent increase over 1990. Imports from Taiwan, Hong Kong, Singapore, and other newly industrialized countries will show the steepest increases in 1991 and succeeding years. Demand for cordless tools should help push U.S. power tool exports higher again in 1991, with exports expected to show an 8 percent increase to $598 million.

Long-Term Prospects

The surge of imports that characterized the 1980s is unlikely to continue. However, imports will remain high enough to act as a brake on the growth of the U.S. industry. Foreign-owned power tool firms, primarily German, Japanese, and Swedish, should continue to expand their U.S. production, limiting import growth and increasing exports, primarily to Canada and Mexico.

Moreover, the industry will benefit from rising demand for—and increased exports of—cordless tools. Cordless tools, both consumer and professional, are expected to account for 28 to 30 percent of electric tool product shipments in the early 1990s. The development of the solar charger, for example, may allow power tools to be marketed in areas lacking readily available electric current. Although German firms are likely to offer stiff competition, U.S. power tool suppliers expect to increase exports to hitherto neglected markets in Eastern Europe and the Soviet Union. One U.S. hardware chain recently announced plans to sell hardware, including power tools, in the Soviet Union.

The marketability of power tools in foreign countries is significantly influenced by national standards. Standards may be used to block entry of tools to a given market. Conversely, the development of common national standards applicable over a range of countries may significantly reduce the costs of market entry. National standards adopted by the European Community, the Canadian Standards Association, and other standard-setting bodies will substantially influence the export potential for U.S. power tools in the 1990s.

Over the next five years the U.S. power tool industry is expected to grow at a compound annual rate of 1.5 percent in constant 1987 dollars. Even achieving this marginal growth rate will depend on continued growth in new residential and non-residential building construction and remodeling. In addition, the universe of power tool buyers must continue to expand, attracting more women, apartment dwellers, and new homeowners.

Manufacturers will continue to introduce new lines of accessories and replacement parts to meet aftermarket demand. Long left to specialty producers, the market for replacement parts such as carbide blades and drill bits has emerged as a highly competitive and fast-growing segment of the industry.—*Edward D. Abrahams, Office of Capital Goods and International Construction, (202) 377-0312, October 1990.*

Additional References

(Call the Bureau of the Census at (301) 763-4100 for information about how to order Census documents.)

1987 Census of Manufactures, Metalworking Machinery, MC87-I-35D, U.S. Bureau of the Census, Washington, DC 20233.

Building Supply Home Centers, Cahners Publishing Co., 275 Washington St., Newton, MA 02158. Telephone: (617) 964-3030.

Chain Saw Age, Associated Publications, Inc., P.O. Box 13390, Portland, OR 97213. Telephone: (503) 287-6115.

Do-It-Yourself Retailing, National Retail Hardware Association, 5822 W. 74th St., Indianapolis, IN 46278. Telephone: (317) 297-1190.

Hardware Age, Chilton Publishing Co., Chilton Way, Radnor, PA 19089. Telephone: (215) 964-4282.

Home Improvement Center, P.O. Box 1400, Lincolnshire, IL 60069. Telephone: (708) 634-2600.

National Home Center News, Lebhar-Friedman Publishing Co., 444 N. Michigan Ave., Chicago, IL 60611. Telephone: (312) 371-9400.

WELDING EQUIPMENT

In 1990, welding equipment shipments reached approximately $2.4 billion in 1987 dollars, an increase of 4 percent over 1989.

Trends and Forecasts: Welding Apparatus (SIC 3548)

(in millions of dollars except as noted)

Item	1987	1988[1]	1989[2]	1990[2]	1991[3]	Percent Change 1987–88	1988–89	1989–90	1990–91
Industry Data									
Value of shipments[4]	2,105	2,490	2,743	2,995	3,234	18.3	10.2	9.2	8.0
Value of shipments (1987$)	2,105	2,405	2,507	2,607	2,686	14.3	4.2	4.0	3.0
Total employment (000)	18.7	19.6	—	—	—	4.8	—	—	—
Production workers (000)	11.5	12.2	—	—	—	6.1	—	—	—
Average hourly earnings ($)	12.10	12.58	—	—	—	4.0	—	—	—
Capital expenditures	45.4	49.1	—	—	—	8.1	—	—	—
Product Data									
Value of shipments[5]	1,918	2,310	2,545	2,779	3,001	20.4	10.2	9.2	8.0
Value of shipments (1987$)	1,918	2,231	2,326	2,419	2,493	16.3	4.3	4.0	3.1

[1] Advance data from the 1988 Annual Survey of Manufactures.

[2] Estimate.

[3] Forecast.

[4] Value of all products and services sold by establishments in the welding apparatus industry.

[5] Value of products classified in the welding apparatus industry produced by all industries.

SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA). Estimates and forecasts by ITA.

Because of higher interest rates and a sluggish economy, sales of welding equipment appear to be leveling off after two very good years in 1988 and 1989.

INTERNATIONAL COMPETITIVENESS

Exports of welding equipment, which rose 4 percent in 1990 to $470 million, helped to maintain growth in the industry.

Canada, traditionally the leading customer for U.S. welding equipment, accounted for 22 percent of the industry's exports. Other major buyers were South Korea (6 percent), Mexico (6 percent), Japan (5 percent), and the United Kingdom (5 percent). Resistance welders accounted for 37 percent of total export shipments, while gas welders and arc welders each accounted for 23 percent.

Imports of welding equipment dropped significantly in 1990 to $368 million. This represents a 23 percent drop from the 1989 total of $480 million. Electric arc welders, full or partly automatic, were the major imported item, totalling more than $65 million, with more than 60 percent coming from Japan. The major foreign suppliers to the U.S. were Japan (45 percent), Switzerland (13 percent), West Germany (8 percent), Canada (7 percent), and Italy (6 percent).

Mergers and acquisitions continued as more U.S. welding companies participated in buyouts and joint ventures with foreign firms.

Outlook for 1991

The relative low value of the dollar, along with aggressive export marketing by U.S. welding firms, have helped to eliminate the industry's trade deficit. A trade surplus of approximately $102 million was achieved in 1990. Continued export growth should maintain this positive trade balance in 1991.

Shipments of welding equipment are expected to maintain a moderate rate of growth in 1991, growing at about 3 percent in real terms.

Long-Term Prospects

Over the next five years, product shipments will grow at a compound rate of about 7 percent in constant dollars and reach approximately $3.6 billion.

Long-term, the outlook for the welding industry appears good. However, a continued downturn in the economy and a softening in those industries that use welding equipment will limit growth.

The industry continues to introduce new products and make technological advances that help to keep the United States in the forefront as a technological leader.

Many of the technological innovations will be exhibited at the American Welding Show in Detroit, Michigan, April 16–18, 1991.—*Alexis Kemper, Office of Capitol Goods and International Construction, (202) 377-5956, September 1990.*

Additional References

The Welding Distributor, Penton Publishing, Inc. 1100 Superior Avenue, Cleveland, OH 44114. Telephone: (216) 696-7000.

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Industrial Machinery

Aggregate shipments of industrial machinery rose 2.4 percent in constant dollars in 1990. Performance across industry sectors ranged from a high of 7 percent for the paper machinery industry to a low of -1 percent for food packaging. Exports grew as a proportion of total shipments, reflecting strong foreign demand in the mining industry and infrastructure expansion in countries that are modernizing. The industrial machinery industry is expected to continue to grow at a rate of about 2.4 percent in 1991.

The category of industrial machinery includes construction machinery (SIC 3531); air-conditioning, refrigeration, and heating equipment (SIC 3585); farm machinery (SIC 3523); mining machinery (SIC 3532); oil and gas field machinery (SIC 3533); paper industries machinery (SIC 3554); printing trades machinery (SIC 3555); food products machinery (SIC 3556); packaging machinery (SIC 3565); and textile machinery (SIC 3552).

Before reading this chapter, please see "How to Get the Most Out of This Book" on page 1. It will clarify questions you may have concerning data collection procedures, factors affecting trade data, forecasting methodology, the use of constant dollars, the difference between industry and product data, sources and references, and the Standard Industrial Classification system (SIC). For other topics related to the subject of this chapter, see chapters 1 (Metals and Industrial Minerals Mining); 2 (Coal Mining); 3 (Crude Petroleum and Natural Gas); 5 (Construction); 9 (Textile Mill Products); 10 (Cans and Containers); 14 (Plastics and Rubber); 15 (Metals); 16 (General Components); 26 (Printing and Publishing); 33 (Foods and Beverages); 34 (Apparel); 36 (Cleaning Preparations and Cosmetics).

Growth in the machinery industries is constrained by the lag in new residential and commercial building; this factor has especially affected the construction machinery and air conditioning sectors. Demand is bouyed, however, by increases in retrofitting, renovation, and replacement.

Developments in technology were important throughout the industry; new, more versatile equipment and computerized processes raised capital costs for manufacturers, but expenditures were recouped through increased sales to users wishing to upgrade equipment. Environmental and safety issues increasingly affect the industrial machinery industry. In response to legislative mandates, manufacturers of air-conditioning and food processing equipment are using alternative, less toxic coolants; the packaging and paper industries machinery sectors are developing machines that make recyclable papers and containers; and farm machinery manufacturers are redesigning farm equipment to meet new agricultural standards and practices.

INTERNATIONAL COMPETITIVENESS

The ratio of exports to total shipments of industrial machinery is increasing. The development of mines and oil fields abroad has intensified demand for mining and oil field equipment; in 1990, 77 percent of oil field machinery shipments were exports, as was 36 percent of mining machinery shipments. Exports of construction machinery increased to 29 percent in 1990, spurred by infrastructure expansion in modernizing economies. Increased exports have been supported by U.S. participation in foreign trade shows.

U.S. Exports and Imports
Industrial Machinery
(in millions of dollars except as noted)

					Percent Change	
SIC	Industry	1989	1990[1]	1991[2]	1989-90	1990-91
3523	Farm machinery and equipment					
	Value of exports	2,854	3,355	3,700	17.6	10.3
	Value of imports	2,300	2,670	2,900	16.1	8.6
3531	Construction machinery					
	Value of exports	4,359	4,580	4,810	5.1	5.0
	Value of imports	2,781	3,015	3,200	8.4	6.1
3532	Mining machinery					
	Value of exports	504	600	672	19.0	12.0
	Value of imports	396	360	375	−9.1	4.2
3533	Oil and gas field machinery					
	Value of exports	2,419	2,530	2,690	4.6	6.3
	Value of imports	31.4	38.9	40.5	23.9	4.1
3552	Textile machinery					
	Value of exports	551	615	650	11.6	5.7
	Value of imports	1,393	1,552	1,630	11.4	5.0
3554	Paper industries machinery					
	Value of exports	465	645	690	38.7	7.0
	Value of imports	962	1,045	1,105	8.6	5.7
3555	Printing trades machinery					
	Value of exports	863	1,174	1,298	36.0	10.6
	Value of imports	1,184	1,188	1,228	0.3	3.4
3556	Food products machinery					
	Value of exports	535	514	540	−3.9	5.1
	Value of imports	417	462	485	10.8	5.0
3565	Packaging machinery					
	Value of exports	486	585	673	20.4	15.0
	Value of imports	593	589	577	−0.7	−2.0
3585	Refrigeration and heating equipment					
	Value of exports	2,822	2,960	—	4.9	—
	Value of imports	2,171	2,647	—	21.9	—
	Industrial Machinery					
	Value of exports	15,858	—	—	—	—
	Value of imports	12,229	—	—	—	—

[1] Estimate

[2] Forecast

SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA). Estimates and forecasts by ITA.

U.S. Trade Patterns in 1989
Industrial Machinery
SIC 3523, 3531, 3532, 3533, 3552, 3554, 3555, 3556, 3565, 3585
(in millions of dollars, percent)

Exports	Value	Share	Imports	Value	Share
Canada & Mexico	4,486	28.3	Canada & Mexico	1,871	15.3
South America	1,481	9.3	South America	334	2.7
European Community	2,396	15.1	European Community	3,898	31.9
East Asia NICs	1,920	12.1	East Asia NICs	576	4.7
Japan	727	4.6	Japan	2,993	24.5
Other	4,849	30.6	Other	2,557	20.9
World Total	15,858	100.0	World Total	12,229	100.0

Top Five Countries

	Value	Share		Value	Share
Canada	3,572	22.5	Japan	2,993	24.5
Mexico	914	5.8	West Germany	2,315	18.9
Australia	816	5.1	Canada	1,509	12.3
United Kingdom	801	5.1	United Kingdom	1,003	8.2
Japan	727	4.6	Italy	850	6.9

See "How to Get the Most Out of This Book" for definitions of the Country Groupings.

SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA).

Imports and market penetration also grew in some sectors, especially textile machinery, due to advancing technology and competitive financing provided by foreign manufacturers. Joint foreign-U.S. operations are increasingly important in this industry as manufacturers seek to position themselves to compete effectively in the post-European Community market. The five largest export markets for U.S. companies are Canada, Mexico, Australia, the United Kingdom, and Japan. The U.S. imports the largest amounts from Japan, Germany, Canada, the United Kingdom, and Italy.

CONSTRUCTION MACHINERY

U.S. construction machinery industry shipments increased about 1.8 percent (constant dollars) in 1990 over 1989. Growth was derived from residential and commercial construction, public works, quarry operations, and surface mining. Products of the industry include crawler and wheel tractors, shovel loaders, power cranes, pavers, scrapers, and portable mineral processing equipment.

In 1990, the level of home and commercial construction slowed and in most areas remained flat or declined, resulting in only modest growth for the construction machinery industry. Nevertheless, the need to repair and renovate bridges and highways stimulated the demand for some types of construction equipment in that important market sector. The expenditure of billions of dollars of federal, state, and local funds for transportation systems each year promotes growth in construction machinery shipments. In 1990, the repair and replacement parts market was particularly important, as some contractors postponed the purchase of new equipment.

Strip mining was another good market for construction machinery in 1990, as many mines expanded and improved their productivity with higher capacity and more efficient earth moving equipment and portable crushing plants. Other markets included solid waste management and timber operations.

The market for construction machinery is very competitive, with manufacturers emphasizing lower production and inventory costs in order to better absorb higher costs from their suppliers. The construction machinery leasing market continues to grow, with many contractors preferring to rent equipment (as a job expense) rather than make large outlays for purchasing. Rental firms are particularly successful in areas where construction activity is sporadic and uneven.

INTERNATIONAL COMPETITIVENESS

U.S. exports of construction machinery were valued at about $4.6 billion in 1990. With about 29 percent of product shipments exported, foreign mining and construction projects were valuable markets for U.S. construction machinery manufacturers. In 1990, the largest foreign markets for U.S. producers in order of magnitude were: Canada, Belgium, Australia, Mexico, and Japan. U.S. imports of construction machinery resumed growth in 1990 to a level of about $3.0 billion. Imports originated primarily from Japan, France, Canada, and West Germany.

Outlook for 1991

The construction machinery industry is expected to show constant dollar growth of about 2.0 percent in 1991. This is based on projected GNP growth. Also, the continued growth in highway construction, repair, and replacement

Trends and Forecasts: Construction Machinery (SIC 3531)
(in millions of dollars except as noted)

Item	1987	1988[1]	1989[2]	1990[2]	1991[3]	Percent Change 1987-88	1988-89	1989-90	1990-91
Industry Data									
Value of shipments[4]	12,773	14,235	15,928	16,824	17,858	11.4	11.9	5.6	6.1
Value of shipments (1987$)	12,773	13,908	14,900	15,170	15,475	8.9	7.1	1.8	2.0
Total employment (000)	81.2	83.7	84.6	85.0	85.2	3.1	1.1	0.5	0.2
Production workers (000)	54.2	57.0	58.1	58.3	58.4	5.2	1.9	0.3	0.2
Average hourly earnings ($)	13.91	14.21	14.45	14.67	—	2.2	1.7	1.5	—
Capital expenditures	336	561	—	—	—	67.0	—	—	—
Product Data									
Value of shipments[5]	11,709	13,255	14,950	15,792	16,762	13.2	12.8	5.6	6.1
Value of shipments (1987$)	11,709	12,950	13,985	14,240	14,525	10.6	8.0	1.8	2.0

[1] Advance data from the 1988 Annual Survey of Manufactures.

[2] Estimate.

[3] Forecast.

[4] Value of all products and services sold by establishments in the construction machinery industry.

[5] Value of products classified in the construction machinery industry produced by all industries.

SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA). Estimates and forecasts by ITA.

should increase demand for this industry, as should expanded coal production in 1991 with concomitant demand for construction machinery used in strip mining.

U.S. shipments of construction machinery will be stimulated by the growing versatility of products in which attachments are designed to be changed quickly. For example, excavators can be equipped with bucket or rock breaker attachments for a wide range of applications. In addition, higher productivity is being achieved through computerized power transmissions, as when a computer automatically controls the engine speed and hydraulic output to maximize productivity and achieve fuel savings. The installation of improved control instruments and micro processors can raise the operator's performance. As a result, fewer machines with faster work cycles will be required in the future. At the same time, these product improvements promote higher product replacement rates in the near term.

Long-Term Prospects

Growth in the U.S. construction machinery industry is linked closely to expansion in the national economy and the rate of new construction. U.S. construction machinery industry shipments are projected to grow at about 2.3 percent during the 1991–95 period. Along with new construction, a growing market for remodeling existing homes and office buildings is anticipated. The need to upgrade and maintain the public utility sector, or infrastructure, in our aging cities is also expected to increase.

Public works construction is likely to be a large market segment assuring growth for the U.S. construction machinery industry. Highway and bridge repair will continue to provide a major source of market demand, as will the construction of new power plants and water supply facilities.

The construction machinery industry markets its products globally; many large manufacturers have subsidiaries in primary foreign markets, such as Europe. In recent years, such firms have increased their spending on foreign manufacturing facilities in order to be closer to major markets and hedge against fluctuations in currency valuations. The value of the U.S. dollar in relation to other major currencies, such as the German mark and Japanese yen, could affect the level of U.S. exports and imports of construction machinery.—*Edward J. McDonald, Office of Capital Goods, Capital Goods and International Construction, (202) 377-0680, September 1990.*

Additional References

(Call the Bureau of the Census at (301) 763-4100 for information about how to order Census documents.)

Construction Machinery, Current Industrial Report, Series MA-35D(89)-1, Bureau of the Census, U.S. Department of Commerce, Washington, D.C. 20233. Telephone: (202) 783-3258.

Construction, Mining, Materials Handling Machinery and Equipment, 1987 Census of Manufactures, Industry Series MC87-1-35B, Bureau of the Census, U.S. Department of Commerce, Washington, D.C. 20233. Telephone: (202) 783-3238.

1988 Annual Survey of Manufactures, M88, Bureau of the Census, U.S. Department of Commerce, Washington, D.C. 20233. Telephone: (301) 763-5752.

AIR-CONDITIONING, REFRIGERATION, AND HEATING EQUIPMENT

Shipments by the air-conditioning, heating, and refrigeration industry increased about 2.2 percent (constant dollars) in 1990. The products of this industry fall under SIC 3585, which include commercial and industrial refrigeration equipment and systems plus air-conditioning equipment for residential, commercial, and industrial applications.

High interest rates and a sluggish economy have adversely affected the market for new construction; therefore, the replacement or retrofitting of inefficient units continued to drive the industry in both residential and commercial markets.

The air-conditioning and refrigeration sectors of the industry were affected by concerns about chloroflourocarbons (CFC), the chemical derivatives of refrigerants that deplete ozone from the atmosphere. In response to this global issue, the Environmental Protection Agency froze U.S. production of chlorofluorocarbons at 1986 levels. A 20 percent reduction from 1986 levels is scheduled for 1993, and a 50 percent reduction is slated for 1998. Furthermore, the June 1990 session of the United Nations Environmental Program (UNEP), the organization that administers the protocol, has proposed accelerated cuts to 50 percent in 1995 and 85 percent in 1997; elimination of CFC production is scheduled for the end of the century. The freeze resulted in reduced production of CFC-11 by 9.5 percent and CFC-12 by 16.2 percent, which has placed machinery manufacturers at a disadvantage, especially for products such as household freezers, refrigerators and supermarket display cases. Independently, Congress imposed a tax of $1.37 on each pound of CFCs (based on ozone depletion

Trends and Forecasts: Air Conditioning, Refrigeration and Heating Equipment (SIC 3585)

(in millions of dollars except as noted)

Item	1987	1988[1]	1989[2]	1990[2]	1991[3]	Percent Change 1987–88	1988–89	1989–90	1990–91
Industry Data									
Value of shipments[4]	17,027	19,594	20,926	21,939	22,554	15.1	6.8	4.8	2.8
Value of shipments (1987$)	17,027	18,869	19,340	19,765	20,120	10.8	2.5	2.2	1.8
Total employment (000)	133	138	142	134	—	3.8	2.9	−5.6	—
Production workers (000)	96.4	101	105	96.7	—	4.8	4.0	−7.9	—
Average hourly earnings ($)	11.25	11.29	11.38	11.54	—	0.4	0.8	1.4	—
Capital expenditures	432	449	—	—	—	3.9	—	—	—
Product Data									
Value of shipments[5]	15,329	17,905	19,122	20,067	20,630	16.8	6.8	4.9	2.8
Value of shipments (1987$)	15,329	17,259	17,689	18,078	18,404	12.6	2.5	2.2	1.8

[1] Advance data from the 1988 Annual Survey of Manufactures.

[2] Estimate.

[3] Forecast.

[4] Value of all products and services sold by establishments in the refrigeration and heating equipment industry.

[5] Value of products classified in the refrigeration and heating equipment industry produced by all industries.

SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA). Estimates and forecasts by ITA.

factors) on January 1, 1990. This tax will escalate to $1.67 in 1992, $2.65 in 1993, $3.10 in 1995, and another 45 cents a pound each year thereafter. Commercial air-conditioning chillers, commercial refrigeration systems, mobile air conditioning and refrigeration systems, drinking water coolers, and home refrigerators and freezers are most affected by the freeze and reductions.

Approval and production of substitute refrigerants are pending. Meanwhile, most major manufacturers supported and endorsed CFC recovery/recycling/reclamation programs in the interim to achieve most effective usage, given current limitations. Quality standards have been established by the Air-Conditioning and Refrigeration Institute (ARI), the American Society of Heating, Refrigeration and Air-Conditioning Engineers (ASHRAE), and the Society of Automotive Engineers (SAE). Several companies have entered the CFC reclamation business, making CFC recovery a viable option in the medium term. These measures have sustained total industry shipments.

Two alternative chemicals—hydrochlorofluorocarbons (HCFCS) and hydrofluorocarbons (HFCS) have been endorsed by manufacturers and supported by UNEP as CFC substitutes. Preliminary studies on these substitutes found significant environmental advantages over CFCs, most importantly the absence of significant contribution to stratospheric ozone depletion.

INTERNATIONAL COMPETITIVENESS

U.S. imports of air conditioning, refrigeration, and heating equipment increased 25 percent in 1990. Exports increased by 30 percent, which widened the industry's positive trade balance.

Changing foreign policies are producing increased opportunities for trade in this industry. For example, political and economic transformations in the Soviet Union and Eastern Europe stimulated several U.S. manufacturers to participate in the American pavilion at the Technika Klimatisazi '90 (Air-Conditioning Technology '90) trade show in Moscow, in April 1990. As a result, U.S. joint venture agreements doubled in the region.

In 1990, for the eighth consecutive year, Canada was the leading export market for U.S. air conditioning and refrigeration equipment and components. Mexico was the second largest market. Continued growth in the Mexican market will depend on successful negotiations of a free trade agreement.

Saudi Arabia remains a significant export market. This was recently illustrated by major joint venture agreements signed as a result of U.S. manufacturers' participation in a trade mission to the region in 1989. Several U.S. companies were awarded major projects, e.g., the new, capacious mosque in Medina and the sprawling Jeddah airport.

The Japanese retain the role as the leading supplier for foreign products, with 35 percent of the import market. Japanese investment in the U.S. air-conditioning industry has increased, with manufacturers present in both component and equipment markets. In the equipment market, the Japanese concentrated on a few niche areas—the nonducted mini split air conditioners, room air conditioners, and gas-fired absorption equipment. Other major suppliers were Canada, 10 percent of the market; Brazil and Mexico, 7 percent; and West Germany, 5 percent.

Outlook for 1991

The air-conditioning, heating, and refrigeration industry is expected to grow slowly at the rate of 1.8 percent in 1991. The increase is attributed primarily to the strength of the retrofit/remodeling/replacement market. New technology, especially the development of new refrigerants that meet federal and international standards for ozone depletion, may also have a beneficial effect on shipments in the air-conditioning sector—for example, the recently introduced heat pump/water heater. However, industry equipment shipments may be adversely affected by the sluggish national economy, especially in the building construction and automotive sectors.

American participation in the international marketplace will be enhanced by U.S. Department of Commerce sponsorship of the Saudi Air Con'91, March 10-14, 1991, the first solo air conditioning and refrigeration industry commercial exhibition in Riyadh, Saudi Arabia.

Long-Term Prospects

During the five-year period, 1990-95, U.S. air-conditioning, refrigeration, and heating equipment shipments are projected to grow at a 2.6 annual rate. Reclamation and the cost of the phaseout of refrigerants will have a significant impact on U.S. machinery manufacturers. The ability of U.S. technology to meet the mandated deadlines will require development of new refrigerants.

Foreign control of U.S. manufactured products will increase as foreign companies increase their investments in U.S. manufacturing facilities. But U.S. companies will continue to expand their overseas production in the European Community and the Pacific Rim.—*Tyrena Holley, Office of Capital Goods, Capital Goods and International Construction, (202) 377-3509, September 1990.*

Additional References

(Call the Bureau of the Census at (301) 763-4100 for information about how to order Census documents.)

Refrigeration, Air Conditioning and Warm Air Heating Equipment, Current Industrial Report Series MA 35M(89)-1, Bureau of the Census, U.S. Department of Commerce, Washington, DC 20233.

The Air-Conditioning, Heating and Refrigeration News, Business News Publishing Company, Troy, MI 48002. Telephone: (313) 362-3700.

Air Conditioning and Refrigeration Institute, 1501 Wilson Boulevard, Arlington, VA 22209. Telephone: (703) 524-8800.

Contracting Business, Penton/IPC Inc., Cleveland, OH 47114. Telephone: (216) 696-7000.

Heating/Piping/Air Conditioning, Penton/IPC Inc., Cleveland, OH 47114. Telephone: (216) 696-7000.

FARM MACHINERY

Shipments of the farm machinery industry (SIC 3523) rose an estimated 3.0 percent (in constant dollars) in 1990. The increase continues a trend begun in late 1988 that continued into 1989 when constant-dollar shipments rose about 5.0 percent.

Farm capital spending continues to rise from a four-year high of $10.2 billion in 1989. Of this amount, $6 billion was spent for tractors and other farm equipment. Farmers were expected to increase capital spending by approximately 5 percent in 1990 to $10.7 billion, according to U.S. Department of Agriculture sources.

Trends and Forecasts: Farm Machinery and Equipment (SIC 3523)

(in millions of dollars except as noted)

Item	1987	1988[1]	1989[2]	1990[2]	1991[3]	Percent Change 1987–88	1988–89	1989–90	1990–91
Industry Data									
Value of shipments[4]	6,880	8,732	9,583	10,306	10,900	26.9	9.7	7.5	5.8
Value of shipments (1987$)	6,880	8,562	8,990	9,260	9,372	24.4	5.0	3.0	1.2
Total employment (000)	57.0	62.4	63.6	64.2	64.6	9.5	1.9	0.9	0.6
Production workers (000)	39.1	43.6	44.6	45.0	45.3	11.5	2.3	0.9	0.7
Average hourly earnings ($)	11.20	11.38	11.58	11.78	—	1.6	1.8	1.7	—
Capital expenditures	200	180	—	—	—	−10.0	—	—	—
Product Data									
Value of shipments[5]	6,385	7,886	8,616	9,246	9,786	23.5	9.3	7.3	5.8
Value of shipments (1987$)	6,385	7,726	8,075	8,300	8,400	21.0	4.5	2.8	1.2

[1] Advance data from the 1988 Annual Survey of Manufactures.

[2] Estimate.

[3] Forecast.

[4] Value of all products and services sold by establishments in the farm machinery and equipment industry.

[5] Value of products classified in the farm machinery and equipment industry produced by all industries.

SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA). Estimates and forecasts by ITA.

Major products in the industry include wheel tractors, planters, fertilizers, tillage equipment, agricultural sprayers, irrigation equipment, harvesting machinery, haying and mowing equipment, and livestock (including dairy and poultry) equipment.

The improved position of the U.S. farmer can be attributed to a combination of factors. Although problems persist for farmers in areas still affected by drought, most of the country enjoyed improved weather conditions in 1990. Farmers also benefited from improved financial devlopments; farm values have risen to almost $700 an acre while farm debt has decreased to an 11-year low of $135.6 billion in 1989. Farmers are optimistic, despite the fact that farm income may be down slightly in 1990 because record harvests depressed grain prices.

Unit sales of tractors below 40 horsepower continued to decline, but sales of other tractors improved. Two- and four-wheel tractors over the 100-horsepower level showed healthy increases in unit sales of 7 percent and 24 percent respectively. Sales of combines were 24.7 percent ahead of 1989 sales as of September 1990.

By August 1990 there were indications that sales were slowing and that dealer inventories of farm machinery had increased, but most industry sources are predicting a 3- to 4-percent increase in sales from 1989 to 1990. Shortline manufacturers reported their factories operating at 80 percent of capacity in the first quarter of 1990 and 70 percent in the second quarter. They are forecasting a dollar volume sales increase of 10 percent.

CASE INTERNATIONAL

Bender Rutter and Associates, Inc.

The farm machinery industry is expected to grow about 1.2 percent in 1991.

Legislation at the state level regulating both land use and use of chemicals in farming could affect productivity and profit margins, thereby reducing future sales of farm machinery. Kansas, Nebraska, South Dakota, and Iowa have passed laws restricting farmland ownership by large corporations. According to industry sources, hog production, which requires large-scale operations, fell 10 percent from 1983 to 1988 in Kansas, while it increased 34 percent in North Carolina where farm ownership is not controlled.

Product liability and farm safety are among other important issues affecting the farm machinery industry in 1991 and beyond. If the Senate passes legislation requiring roll-over protective structures (ROPS) on all tractors, industry sources say the expense of retrofitting older tractors could exceed original costs.

Environmental concerns are also affecting agricultural practices and, in turn, selection and purchase of equipment. The new concept of environmentally safe farming—"low-input sustainable agriculture (LISA)—which calls for reduced use of chemical fertilizers and pesticides, is being implemented in selected areas. Congress increased funding for a LISA study of "low-input sustainable agriculture" to $4.5 million in 1989 from $3.9 million in 1987.

Further large mergers can be expected over the next decade as the farm machinery industry adjusts to worldwide overcapacity. Some industry sources estimate that farm tractor capacity is almost double actual demand in Western countries. In 1990, Allis-Gleaner Company was formed to take over Deutz-Allis from Klockner-Humboldt-Deutz Corp (KHD) of Cologne, Germany. This returns the company to U.S. ownership and it will once again manufacture tractors in the United States. In another development, Ford New Holland, the agricultural equipment division of Ford Motor Co., merged with Fiat Agri Products of Modena, Italy.

INTERNATIONAL COMPETITIVENESS

U.S. exports of farm machinery registered a moderate surplus over imports of $73 million in 1989. This marked the first trade surplus for the industry since 1985. If certain parts categories such as brakes and drive axles (used in both farm and construction equipment, but not separated under the Harmonized System that classifies commodities for trade) are included, exports in 1989 reached about $2.9 billion compared to imports of $2.3 billion. In 1990, exports of farm machinery are expected to reach $3.4 billion compared to imports of $2.7 billion. The principal export markets for U.S. farm machinery in rank order are Canada, the European Community (EC), Australia, Mexico, and Saudi Arabia, accounting for about 75 percent of U.S. exports. Principal overseas suppliers for farm machinery to the U.S. are the EC, Canada, and Japan, supplying 90 percent of U.S. imports.

Tractors and parts comprise the bulk of both imports and exports. Other strong categories of U.S. exports include agricultural sprayers, harvesting machinery, and equipment for haying, mowing, and irrigation.

Outlook for 1991

Unrest in the Middle East could affect the price of fueling tractors and nitrogen-based fertilizers, raising operating costs and cutting profits in 1991. However, U.S. manufacturers do not expect the Persian Gulf situation to affect 1991 farm equipment sales significantly. They forecast sales equal to or slightly above 1990 levels. The farm machinery industry is expected to show constant dollar growth of about 1.2 percent in 1991.

Long-Term Prospects

Assuming favorable weather conditions and beneficial government policies, the U.S. farm machinery industry can continue to enjoy stability and moderate growth. Further mergers of large companies can be expected in the 1990s as the farm machinery industry adjusts to worldwide overcapacity.—*Mary R. Wiening, Office of Capital Goods, (202) 377-4708, September 1990.*

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Implement and Tractor, P.O. Box 1420, Clarksdale, MS38614. Telephone: (601) 624-8503.

Statistical Reports, Equipment Manufacturers Institute, 10 S. Riverside Plaza, Suite 1220, Chicago, IL 60606-3710. Telephone: (312) 321-1470.

Short Liner, Farm Equipment Manufacturers Association, 243 North Lindberg Blvd., St. Louis, MO 63141. Telephone: (314) 991-0702.

Foodwatch, Agriculture Council of America, 1250 Eye St., N.W., Suite 601, Washington, DC 20005. Telephone: (202) 682-9200.

Agricultural Engineering, 2950 Niles Road, St. Joseph, MI 49085-9659. Telephone: (616) 429-0300.

MINING MACHINERY

In 1990 U.S. mining machinery industry (SIC 3532) shipments increased about 2.5 percent in constant dollars. Relatively high production levels for most metals and minerals increased the demand for mining equipment. Also, the refurbishing of many mines has stimulated the demand for replacement equipment. Many U.S. mines have upgraded their mineral extraction and processing operations to remain competitive.

For mining operations, higher capacity machinery is being marketed to raise production levels and reduce mining costs per ton. Also, continuous face haulage conveyor systems are being developed to reduce the need for high-cost face haulage vehicles. Heavy duty feeder breakers are available to crush mined minerals so that they can be efficiently carried by conveyors. Portable in-pit crushers help lower extraction costs by reducing the number of haulage vehicles needed in strip mines. In an effort to streamline the mining cycle, some continuous miners are now equipped with roof bolters to reinforce mine ceilings.

New longwall mining equipment is providing high-productivity gains for coal mining operations. These systems permit the mining of a coal face of several hundred feet with the coal cutter and conveyor systems fully integrated. Portable hydraulic roof supports are provided to protect both miners and machinery from roof falls.

Product liability continued to concern manufacturers of mining equipment. Many in the industry favor the adoption of a uniform Federal product liability law that would reduce litigation and insurance costs. Environmental issues are affecting mining operations and demand for mining machinery. The stepped-up pace of recycling is providing more substitute sources of mined products such as lead and aluminum.

Trends and Forecasts: Mining Machinery (SIC 3532)

(in millions of dollars except as noted)

Item	1987	1988[1]	1989[2]	1990[2]	1991[3]	Percent Change 1987-88	1988-89	1989-90	1990-91
Industry Data									
Value of shipments[4]	1,518	1,592	1,711	1,834	1,954	4.9	7.5	7.2	6.5
Value of shipments (1987$)	1,518	1,539	1,568	1,607	1,639	1.4	1.9	2.5	2.0
Total employment (000)	13.6	13.7	13.9	14.2	14.4	0.7	1.5	2.2	1.4
Production workers (000)	8.2	8.6	8.8	9.1	9.3	4.9	2.3	3.4	2.2
Average hourly earnings ($)	11.09	11.31	11.50	11.75	—	2.0	1.7	2.2	—
Capital expenditures	36.6	34.1	—	—	—	−6.8	—	—	—
Product Data									
Value of shipments[5]	1,363	1,456	15.66	1,692	1,816	6.8	7.6	8.0	7.3
Value of shipments (1987$)	1,363	1,405	1,433	1,469	1,498	3.1	2.0	2.5	2.0

[1] Advance data from the 1988 Annual Survey of Manufactures.
[2] Estimate.
[3] Forecast.
[4] Value of all products and services sold by establishments in the mining machinery industry.
[5] Value of products classified in the mining machinery industry produced by all industries.

SOURCE: U.S. Department of Commerce. Bureau of the Census; International Trade Administration (ITA). Estimates and forecasts by ITA.

America Mining Congress

This computerized steam shovel is being used at the Mount Thorley Mine, Hunter Valley, Australia. U.S. mining machinery industry shipments are projected to increase about 2 percent in 1991.

INTERNATIONAL COMPETITIVENESS

The mining machinery market is truly global in scope as the search and development of major ore bodies is carried on in nearly every part of the world. In 1990, about 35 percent of U.S. mining machinery plant shipments were exported. Much of the foreign mineral resources are nationalized or state-controlled. Therefore, foreign governments often promote mining operations in order to earn foreign exchange and provide employment. The major foreign markets for U.S. mining equipment in 1990 were Canada, China, Mexico, Indonesia, and Australia. U.S. imports of mining equipment originated primarily from West Germany, the United Kingdom, Canada, and Japan.

The ability of U.S. manufacturers of mining machinery to provide competitive financing will be a critical factor in selling to major foreign mining operations. Also, it is important to have experienced agents and distributors in foreign mining regions to provide parts and servicing. In less developed countries, sales of mining equipment for major mining projects often involve international lending institutions such as the World Bank.

Exports of U.S. mining machinery is expected to be stimulated by the trend in less-developed countries to process their minerals further in order to obtain a greater share of the value added. Also, foreign markets are likely to grow as major mining companies seek out large high-quality deposits with low cost per ton potential.

Outlook for 1991

In 1991, the U.S. mining machinery industry shipments are projected to increase about 2.0 percent in constant dollars, based on continued growth in the GNP and mining activity. More mining equipment will be needed to efficiently supply the wide range of metals and minerals needed for world economic development. Quarries are major end-users of mining equipment to crush and process rock for building materials and highway construction. U.S. coal production is projected for growth in 1991 which is expected to stimulate the market for specialized products such as continuous miners, shuttle cars, coal drills, and crushers.

Long-Term Prospects

Shipments by the U.S. mining machinery industry are projected to grow at an annual real rate of about 2.3 percent during the 1991–95 period. Mining equipment demand will be supported by the continued need for basic mined products such as iron ore and strategic materials including titanium for high performance applications. Increased demand for advanced materials—such as metal composites—that are formed from mined ores, and demand from less-developed countries should stimulate growth in the U.S. mining machinery industry. Recycling of metal products could slow the demand for mining equipment in some regions. The U.S. mining machinery market will also be strongly affected by Federal, state, and local regulations controlling land use, pollution emissions/discharges, and land reclamation. The availability of public lands for mining, particularly in the western United States, will have an important impact on the U.S. demand for mining machinery. The mining equipment safety standards set by the Mine Safety and Health Administration (MSHA) will influence the future designs of mining machinery and equipment.—*Edward McDonald, Office of Capital Goods, (202) 377-0680, September 1990.*

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OIL AND GAS FIELD MACHINERY

In 1990 U.S. oil and gas field machinery industry (SIC 3533) shipments increased by about 4.5 percent (constant dollars) over 1989. A significant improvement in the level of American drilling activity stimulated the demand for U.S. petroleum equipment. Declining U.S. crude oil production prompted many U.S. operators to step up their exploration and development operations.

Energy and environmental issues are important factors in determining drilling levels, and, therefore, equipment demand. Federal government leasing activities based on environmental and energy considerations could have a major impact on the level of U.S. drilling in 1991. Attention is focused on Federal government policies concer

the Outer Continental Shelf and in the Arctic

life Refuge of Alaska. Some observers take th

increased leasing will encourage more domest

could result in higher domestic crude oil prod

reliance on imports. Others call for greater o

measures and more reliance on alternate sour

Recent development of horizontal drilling

ables drilling contractors to tap parallel oil d

can be more efficient than conventional vert

ing. Research will continue on improving dr

ductivity through more automated drill p

systems and more durable drill bits for the

drilling conditions.

The offshore drilling rig utilization rate

expanding sales of the more advanced and

ment needed for offshore exploration and devel

equipment included subsea production system

on the ocean floor and permit more producti

and marginally producing offshore wells.

INTERNATIONAL COMPETITIVENESS

Tighter world supplies of crude oil due to t

raised oil prices during the second half of 1990

strength in oil prices increased capital in

upstream petroleum projects in many cou

result, drilling activity expanded in most o

foreign oil and natural gas producing regions.

In 1990 about 77 percent of U.S. oil field ma

ments were exported. The major foreign mark

petroleum equipment were the United Kingd

pore, Venezuela, China, Egypt, Colombia, In

geria, and the United Arab Emirates. The c

ports to these countries accounted for about

total foreign demand for U.S. petroleum equi

Foreign markets are of growing importance

oil field machinery industry because more major

oil and natural gas are likely to be in foreign re

many foreign governments are promoting their

producing sectors in order to become more self-

energy and to earn more hard currency from

refined petroleum products.

Much of the foreign demand for petroleum e

through government-owned or controlled oil a

Trends and Forecasts: Oil and Gas Field Machinery (SIC 3533)

(in millions of dollars except as noted)

Item	1987	1988[1]	1989[2]	1990[2]	1991[3]	Percent Change		
						1987-88	1988-89	1989-
Industry Data								
Value of shipments[4]	2,728	3,362	3,556	3,785	4,085	23.2	5.8	6.4
Value of shipments (1987$)	2,728	3,225	3,355	3,505	3,680	18.2	4.0	4.5
Total employment (000)	24.8	26.5	26.8	27.6	28.1	6.9	1.1	3.0
Production workers (000)	13.3	15.1	15.2	16.1	16.4	13.5	0.7	5.9
Average hourly earnings ($)	13.05	13.12	13.20	13.30	—	0.5	0.6	0.8
Capital expenditures	31.7	47.2	—	—	—	48.9	—	—
Product Data								
Value of shipments[5]	2,291	2,934	3,095	3,296	3,553	28.1	5.5	6.5
Value of shipments (1987$)	2,291	2,830	2,945	3,075	3,230	23.5	4.1	4.4

[1] Advance data from the 1988 Annual Survey of Manufactures.

[2] Estimate.

[3] Forecast.

[4] Value of all products and services sold by establishments in the oil and gas field machinery industry.

[5] Value of products classified in the oil and gas field machinery industr

industries.

SOURCE: U.S. Department of Commerce: Bureau of the Census;

Administration (ITA). Estimates and forecasts by ITA.

panies. In some cases the granting of foreign government licenses for petroleum exploration is linked to the purchase of some locally produced equipment. Therefore, in order to be more successful in foreign sales, many U.S. oil field equipment manufacturers are forming joint ventures or foreign affiliates.

As a major trade issue in 1990, the European Community (EC) proposed a directive that would place a 50 percent EC content requirement on petroleum equipment purchased by EC members and a 3 percent price advantage over non-European Community producers, including the United States.

Outlook for 1991

U.S. oil field machinery industry shipments are expected to show a constant dollar growth rate of 5 percent in 1991. This assumes relatively high crude oil prices. The demand for petroleum equipment will be directly affected by oil field drilling and production levels, which in turn are strongly influenced by oil and natural gas price movements and expectations of future price levels.

Forecasting future oil prices is difficult due to fluctuations in world supplies and demand for oil. The crude oil production levels of members of the Organization of Petroleum Exporting Countries in particular can vary. World economic conditions and the severity of the weather have a strong effect on petroleum demand. Nevertheless, crude oil prices of over $20 a barrel can be expected to raise the level of oil field drilling in the United States and in many foreign countries.

Higher oil prices would economically justify more workover and secondary recovery of existing wells. This would involve a greater demand for well repairing and specialized water and steam injecting equipment. Relatively high petroleum price conditions will also encourage oil and gas operators to undertake more costly offshore and deepwell drilling activities. These operations require more advanced petroleum equipment, of which the United States is a major supplier.

Long-Term Prospects

The U.S. oil field machinery industry is forecast to have an annual real growth rate of about 3.4 percent during the 1991-95 period. This growth is based on a long-term rise in oil prices. However, industry shipments during this period could be uneven due to unstable petroleum prices and the uncertainties regarding the world supply and demand for petroleum.

U.S. regulations controlling the leasing of offshore areas and federal lands for drilling will continue to have a major effect on the level of U.S. oil and natural gas exploration and development. The United States and foreign demand for petroleum equipment will also be stimulated by improvements in equipment designs and changes in petroleum exploration and production techniques.

The U.S. petroleum equipment industry will face stronger competition from foreign countries, including the United Kingdom, West Germany, France, and Japan. Financing will be a critical factor in selling to major foreign petroleum projects. As foreign countries take on a greater economic role in their petroleum industries, U.S. manufacturers will be encouraged to form joint ventures and licensing agreements with local firms. This will accelerate U.S. technology transfer to foreign markets.—*Edward J. McDonald, Office of Capital Goods, (202) 377-0680, September 1990.*

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A Primer of Oilwell Drilling, International Association of Drilling Contractors, P.O. Box 4287, Houston, TX 77210. Telephone: (713) 578-7171.

PAPER INDUSTRIES MACHINERY

Shipments of the U.S. paper machinery industry (SIC 3554) rose an estimated 7 percent in constant 1987 dollars during 1990, again reaching record levels as prior year orders are completed. Increased exports and long lead times combined with a record order backlog to produce a fourth year of rising shipments. Nevertheless, the first signs of a slowdown appeared as fewer new projects were announced and new orders appeared to sag in the second half of 1990.

Trends and Forecasts: Paper Industries Machinery (SIC 3554)

(in millions of dollars except as noted)

Item	1987	1988[1]	1989[2]	1990[2]	1991[3]	Percent Change 1987-88	1988-89	1989-90	1990-91
Industry Data									
Value of shipments[4]	1,867	2,007	2,295	2,540	—	7.5	14.3	10.7	—
Value of shipments (1987$)	1,867	1,918	2,051	2,190	2,267	2.7	6.9	6.8	3.5
Total employment (000)	17.1	17.3	18.0	18.4	—	1.2	4.0	2.2	—
Production workers (000)	9.6	10.4	—	—	—	8.3	—	—	—
Average hourly earnings ($)	12.51	12.16	—	—	—	−2.8	—	—	—
Capital expenditures	45.7	59.9	—	—	—	31.1	—	—	—
Product Data									
Value of shipments[5]	1,581	1,912	2,215	2,457	—	20.9	15.8	10.9	—
Value of shipments (1987$)	1,581	1,849	1,988	2,127	2,202	17.0	7.5	7.0	3.5

[1] Advance data from the 1988 Annual Survey of Manufactures.

[2] Estimate.

[3] Forecast.

[4] Value of all products and services sold by establishments in the paper industries machinery industry.

[5] Value of products classified in the paper industries machinery industry produced by all industries.

SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA). Estimates and forecasts by ITA.

The sharp rise in paper machinery shipments since 1986 is substantially attributable to a steep rise in capital spending by the paper industry. As of mid-1990 the U.S. paper industry reported a 11.3 percent increase in its planned new capital spending for 1990. The paper industry's current dollar capital spending has doubled from $8.54 billion in 1987 to an estimated $17.36 billion in 1990.

Paper industries machinery shipments include machinery and equipment for new production capacity and for rebuilding machinery and equipment in place. These products include machinery for wood preparation, pulp-and paper-mills, and paper converting. Production of machinery and equipment used for rebuilding mills, which traditionally accounts for about 70 percent of new orders, has gained in popularity because of its role in keeping costs down.

However, faced with a historic pattern of boom-bust activity, paper machinery makers concentrated most of their new investment during the past few years in research and development facilities rather than increased plant capacity. Manufacturers turned to subcontracting when facilities were strained; more recently, the fallback in new orders has allowed more work to be completed in-house.

Employment growth is expected to be about 2 percent in 1990, with most of the increase representing engineering and sales personnel. Some paper machine companies have reported a shortage of engineering staff. Employers fearful of a repetition of the painful cutbacks during the 1982–83 recession have been reluctant to add significant numbers of new employees during the upturn.

Environmental concerns, especially relating to recycling, have affected paper industries machinery. State legislation has created a substantial new demand for equipment used to process paper recyclables, including old newspapers, magazines, and old corrugated containers. Legislation enacted in California and Connecticut mandates use of specific percentages of recycled paper stock in newsprint production, with the required amount increasing to a fixed level after 1994. U.S. suppliers have captured a large share of the de-inking systems and other equipment used in processing the recyclables. As of mid-1990, a trade journal reported 13 recycled newsprint projects underway in the U.S. and Canada, with another 12 North American de-inking facilities planned by 1994. These projects include installation of new machines at both new and existing mill sites.

INTERNATIONAL COMPETITIVENESS

The industry boom has produced a steep increase in two-way trade with record levels of imports and exports in 1990. Imports could rise by 15 percent to just over $1.1 billion in 1990 while exports are headed upward with a 55 percent increase to $720 million. The export increase was fueled by increased trade with Canada and Mexico and shipments to a wider number of non-North American markets. The decade-long balance of trade deficits will persist as imports continue to rise, although at a slower pace. The traditional import sources, Germany, Canada, Finland, and Japan, along with Brazil, will provide the bulk of paper machinery imports.

Foreign-based suppliers continue to expand their U.S. holdings. Foreign-owned firms, primarily Finnish and German, have established substantial U.S. manufacturing operations or concluded joint venture agreements for U.S. assembly or production of previously imported equipment. In the U.S., paper machinery firms have invested substantially in parts stocking facilities, especially near Southern mills, and have sought to provide faster parts service to reduce expensive machine downtime. Industry consolidation continues apace as both U.S. and foreign firms seek mergers and acquisitions primarily designed to position themselves to compete effectively in the U.S. or post-1992 European Community markets.

Sharp growth in two-way trade in paper industry machinery products accompanied foreign expansion into the U.S. market. The industry has long been sensitive to changes in exchange rates, with a traditional lag of one-to-two years in their effects on trade. The lower valued dollar since 1985, especially in relation to Finnish and German currencies, assisted U.S. exports and encouraged foreign-owned suppliers to produce at U.S. plants. Thus the favorable exchange rates have contributed to the expansion of foreign-owned paper machinery firms in the United States while simultaneously enhancing the export position of the U.S.-based industry.

Canada is the principal export market for U.S. paper machinery. The increased demand for recycled newsprint has placed severe pressure on Canadian newsprint producers. Canada exports most of its virgin newsprint to the United States. However, only two Canadian mills that process recycled paper were in operation at the end of 1990. Canada must increase its recycled paper capacity significantly if it is to retain market share in the face of the requirements set forth in states' legislation.

The U.S. paper machinery industry has historically engaged in very little trade with Eastern Europe. Although competition from Finland and Germany is intense, several U.S. producers have recently sold equipment or bid on contracts for Eastern European mill projects.

Outlook for 1991

The continuation into 1990 of a high level of paper industry capital spending and a large backlog of orders at major paper industries machinery manufacturers virtually assures a fifth straight year of increased shipments in 1991. Product shipments, in constant dollars, will rise 4 percent. After four years of record growth, a perceptible slowing in new orders should mark the 1991 paper machinery year although the long lead times required for most paper machinery products should stay the major impact on shipments into 1992. International trade in both directions should increase modestly, with exports and imports each likely to show an increase of about 5 percent.

Long-Term Prospects

During the period 1991–95, the compound annual growth rate will run in excess of 5.0 percent in constant dollars. However, given the historic boom-bust pattern of the industry, growth will almost certainly diminish at some point during that period.

The lower valued dollar, coupled with expansion of North American paper manufacturing, produced the favorable current conditions in the industry. As it adjusts to slower growth, however, the industry faces significant challenges in international competitiveness and its ability to maintain the current export expansion. Its long term prospects will depend heavily on continued export expansion and the ability to undertake work in U.S. plants that would otherwise be performed in U.S.-owned foreign subsidiaries.

Canada will undoubtedly remain the principal export market for U.S. paper machinery. The U.S.-Canada Free Trade Area Agreement provides for a five-year phaseout (1989-93) of paper machinery tariffs in both directions. This will benefit U.S. exports, as most paper machinery had been subject to a 9.2 percent ad-valorem duty upon entry into Canada, while U.S. tariffs are substantially lower. As earlier noted, Canada's need for de-inking systems and other recycled paper processing equipment should enhance U.S. exports during the upcoming years.

Further projects in Eastern Europe are also likely as the region's industry seeks to overhaul its antiquated paper mills and meet new demands for newsprint and writing grade stock created by the transition to a market economy. Additionally, U.S. producers have begun to compete for paper machinery sales in the Soviet Union as that country seeks to upgrade its paper industry.—*Edward D. Abrahams, Office of Capital Goods and International Construction, (202) 377-0312, September 1990.*

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Paper, Film & Foil Converter, 29 N. Wacker Drive, Chicago, IL 60606. Telephone: (312) 726-2574.

PIMA Magazine, 2400 E. Oakton Street, Arlington Heights, IL 60005. Telephone: (708) 956-0250.

Pulp and Paper, Miller-Freeman Publishing Company, 500 Howard Street, San Francisco, CA 94105. Telephone: (415) 397-1881.

TAPPI Journal, Technology Park/Atlanta, P.O. Box 105113, Atlanta, GA 30348. Telephone: (404) 446-1400.

PRINTING TRADES MACHINERY

The estimated value of shipments by the printing trades machinery industry in 1990 reached approximately $3.2 billion measured in 1987 constant dollars, an increase of 1 percent over 1989.

Printing machinery shipments slowed in growth in response to higher interest rates and inflation, the resultant overall slowdown in the U.S. economy, and a specific slowdown in the commercial printing sector. Revenue from commercial print advertising is one of the main forces driving demand for printing machinery purchases. Classified, real estate, and automobile advertising all suffered cutbacks in 1990, causing printers to defer purchase of new printing equipment.

INTERNATIONAL COMPETITIVENESS

Technological change continues in this stable and mature industry. Automation is finding its way into all segments of printing equipment categories from prepress products to bindery equipment and U.S. manufacturers of printing equipment are part of this movement. For example, more than 160 U.S. firms demonstrated their products at the world's largest printing and graphic arts event, Drupa '90, held in 1990 in Dusseldorf, West Germany, for display of such equipment as new high-speed multicolored presses, color scanners, plateless printing press, and digital color proofing systems.

The push for new equipment in the U.S. industry stems from foreign demand. Exports provided the boost to shipments in 1990, reaching approximately $1.2 billion, an increase of 36 percent over 1989.

In 1990 roll-fed offset printing presses were the major export item, with 19 percent of the export total. The leading markets for U.S. printing trades machinery were Canada (21 percent), Mexico (9 percent), Brazil (8 percent), the United Kingdom (7 percent), and Japan (6 percent). Mexico showed the largest increase in U.S. export purchases of printing

Trends and Forecasts: Printing Trades Machinery (SIC 3555)

(in millions of dollars except as noted)

Item	1987	1988[1]	1989[2]	1990[2]	1991[3]	Percent Change 1987-88	1988-89	1989-90	1990-91
Industry Data									
Value of shipments[4]	2,858	3,257	3,387	3,488	3,589	14.0	4.0	3.0	2.9
Value of shipments (1987$)	2,858	3,106	3,148	3,180	3,213	8.7	1.4	1.0	1.0
Total employment (000)	25.0	26.0	26.9	24.2	—	4.0	3.5	−10.0	—
Production workers (000)	12.1	12.9	13.1	11.3	—	6.6	1.6	−13.7	—
Average hourly earnings ($)	12.10	12.74	13.08	13.40	—	5.3	2.7	2.4	—
Capital expenditures	114	86.3	—	—	—	−24.3	—	—	—
Product Data									
Value of shipments[5]	2,554	2,727	2,836	2,918	3,002	6.8	4.0	2.9	2.9
Value of shipments (1987$)	2,554	2,601	2,635	2,660	2,688	1.8	1.3	0.9	1.1

[1] Advance data from the 1988 Annual Survey of Manufactures.
[2] Estimate.
[3] Forecast.
[4] Value of all products and services sold by establishments in the printing trades machinery industry.
[5] Value of products classified in the printing trades machinery industry produced by all industries.

SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA).

Estimates and forecasts by ITA.

Oscar and Associates, Inc.

Printing trades machinery shipments are expected to grow by about 1 percent to an estimated $2.7 billion.

equipment, jumping from tenth place in 1989 to second place in 1990; the increase was fueled primarily by purchases of roll-fed offset presses.

In 1990 the import growth rate of printing machinery slowed further to .3 percent, reaching $1.2 billion. Sixty-five percent of all imported printing machinery was supplied by West Germany and Japan; these two countries accounted for 90 percent of all shipments of sheet-fed printing presses.

Although sheet-fed offset press shipments were down by 17 percent from last year, they were the major imported product. Sheet-fed offset presses accounted for over $330 million in inbound shipments, representing 28 percent of all imports.

Outlook for 1991

Product shipments of printing trades machinery are projected to remain relatively flat in 1991, growing by about 1 percent to an estimated $2.7 billion.

Higher interest rates will continue to put a damper on capital spending. Demand for printing equpment could speed up as printers modernize older equipment to reduce costs, and install new presses to meet increased demand for color printing. The 1992 elections and 1992 Olympics will certainly be a boost to the commercial printing industry, possibly als increasing sales. However, the continued slowdown in th economy will make growth in this industry an uphill struggl

Foreign markets will continue to provide outlets for U.S printing trades machinery. Exports are projected to reacl approximately $1.3 billion in 1991, and if the curren growth trends continue, a trade surplus can be expected fo the first time since 1983.

Long-Term Prospects

Industry shipments are expected to grow at a compound annual rate of about 3 percent during the next five years, after adjusting for inflation.

Technological developments in the printing machinery industry continue to center on increased efficiency and productivity. Web offset presses are becoming faster, reaching speeds of 2,500 feet per minute. Sheet-fed offset press trends include the use of more printing units as customers' demand for color increases. More units are being sold to accommodate expanding color and coating needs. Also, electronic technology advancements are speeding up the make ready process. In flexography, development of new soft photopolymer plates is significantly reducing plate manufacturing time and in producing sharper halftones. Greater automation in bindery operations has increased its speed and improved its coordination with press operations.—*Alexis Kemper, Capital Goods and International Construction, (202) 377-5956, September 1990.*

Additional References

(Call the Bureau of the Census at (301) 763-4100 for information about how to order Census documents.)

1987 Census of Manufactures, Printing Trades Machinery, SIC Industry Group 355, Series MC87-1-35D, Bureau of the Census, U.S. Department of Commerce, Washington, DC 20232. Telephone: (301) 763-7304.

1990 Technology Forecast, Graphic Arts Technical Foundation, 4615 Forbes Avenue, Pittsburgh, PA 15213. Telephone: (412) 621-6941.

Printing Impressions, North American Publishing Company, 401 North Broad Street, Philadelphia, PA 19108. Telephone: (215) 238-5300.

Graphic Arts Monthly, Technical Publishing Company, 666 Fifth Avenue, New York, NY 10102. Telephone: (212) 595-8125.

FOOD PRODUCTS MACHINERY

Shipments of food products machinery (SIC 3556) increased 1.3 percent in 1990 in terms of 1987 dollars. Total employment in the industry showed no change from the 20,400 persons reported in 1989.

Trends and Forecasts: Food Products Machinery (SIC 3556)

(in millions of dollars except as noted)

Item	1987	1988[1]	1989[2]	1990[2]	1991[3]	Percent Change 1987–88	1988–89	1989–90	1990–91
Industry Data									
Value of shipments[4]	1,971	2,095	2,284	2,444	2,627	6.3	9.0	7.0	7.5
Value of shipments (1987$)	1,971	2,007	2,073	2,100	2,136	1.8	3.3	1.3	1.7
Total employment (000)	19.2	20.2	20.4	20.4	20.8	5.2	1.0	0.0	2.0
Production workers (000)	11.8	12.3	12.5	12.5	12.8	4.2	1.6	0.0	2.4
Average hourly earnings ($)	11.27	11.30	11.64	11.99	—	0.3	3.0	3.0	—
Capital expenditures	47.4	33.9	—	—	—	−28.5	—	—	—
Product Data									
Value of shipments[5]	1,735	1,696	1,850	1,980	2,128	−2.2	9.1	7.0	7.5
Value of shipments (1987$)	1,735	1,625	1,679	1,701	1,730	−6.3	3.3	1.3	1.7

[1] Advance data from the 1988 Annual Survey of Manufactures.

[2] Estimate.

[3] Forecast.

[4] Value of all products and services sold by establishments in the food products machinery industry.

[5] Value of products classified in the food products machinery industry produced by all industries.

SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA). Estimates and forecasts by ITA.

The food processing industry has undergone many dramatic changes in recent years. Development of new technology and resulting efficiency in production is expected to continue. Increasing production costs and frequent inability to raise prices in highly competitive markets is encouraging innovative and efficient technologies, especially computer integrated manufacturing.

The food products machinery industry supplies all equipment for the commercial and industrial processing of food products, but does not manufacture food service equipment used in institutions, restaurants, and hotels. The largest portion of the food products machinery manufactured domestically consists of commercial equipment such as slicing machinery, choppers, grinders, cutters, dicers, and similar machines. The second largest segment of the industry produces equipment for processing foods and beverages from grains, fruits and vegetables, and meat and poultry. Other major segments include presses and crushers for making wine, cider, and juices; ovens for bakery products; and machinery for the preparation of fish and shellfish.

Food consumers worldwide are eating healthier foods, which has resulted in shifts from red meat to chicken and fish products, lower consumption of eggs and dairy products, and a greater consumption of fresh fruits and vegetables. These concerns for health and nutrition are causing older food processing facilities to be replaced sooner than would have once been the case, and stimulating more concentration to obtain the advantages of larger scale production, and vertical and horizontal integration.

Food safety is also an increasing concern; the food processing industry continues to face attacks from health advocacy and consumer activist groups over issues as diverse as pesticide residues, hormones in meat, and poor inspection of meat and seafood processing facilities.

INTERNATIONAL COMPETITIVENESS

U.S. exports of food processing machinery amounted to $513.8 million in 1990, equivalent to 25.9 percent of total product shipments. Exports remained static from the previous year. Canada has historically been the largest foreign market for U.S. food processing machinery and accounted for over 21 percent of total exports. Mexico continued as the second largest market, followed closely by Japan and the United Kingdom. Other major markets, ranked in declining order, were the Netherlands, West Germany, France, Australia, South Korea and Spain. Exports to the Soviet Union, which reached a record high of $13.9 million in 1989, declined to approximately $500,000 in 1990. Most of the 1989 sales to the Soviet Union consisted of equipment for three raisin processing plants in the Republic of Uzbekistan.

Major exports included miscellaneous machinery used for the preparation and manufacture of food or beverage products; bakery products and pasta manufacturing equipment; meat and poultry packing plant machinery and parts; and parts for dairy processing equipment. Since most food processing equipment is custom-built to meet the specific requirements of the food processor, many manufacturers have difficulty choosing the correct or most appropriate classification when reporting shipments to the Bureau of the Census or to Customs. Therefore, many items are reported under the miscellaneous or "catch all" categories.

Imports of food processing machinery in 1990 totaled $462 million, an increase of over 10 percent from 1989. West Germany remained the largest U.S. supplier of food processing machinery, accounting for over 27 percent of all imports. Japan and Italy accounted for 25 percent of imports. Other leading suppliers, ranked in declining order, were the Netherlands, United Kingdom, Denmark, Switzerland, France, Canada, and Taiwan. Major imports of food machinery were comprised of machinery for processing food or drinks, bakery equipment and parts, and chocolate and confections.

The establishment of close business ties with the food industries of the European Community (EC) before the 1992 merger will be essential for maintaining successful business relationships and curbing deeper penetration of European food machinery sales into world markets. The high rate of domestic mergers and acquisitions has compelled food processing companies to adopt new technologies that help develop new food products that lower costs, improve quality, and increase yield.

Outlook for 1991

Industry shipments are expected to rise 1.7 percent in 1991. Changes in the public's food tastes will stimulate development and sales of new equipment. The industry faces added costs associated with intensified health and inspection requirements, a trend that will reduce profits.

Long-Term Prospects

During the 1991-1995 period, food product machinery shipments are projected to increase 3.5 percent, compounded annually, as food processing companies continue to meet consumer changing demands for foods that are both healthy and convenient to use. Potential for food processing technology and equipment sales now exists in Eastern Europe, where central planning is giving way to market economies and where consumer goods industries need to modernize during the 1990s. The impact of the events in the Middle East should not have any sizeable long-term effect on the food processing or food processing machinery industries. Historically during a crisis, consumers cut back on fancy items and buy more basic meat, fruit, and vegetable products. Thus the market for staple items should remain quite strong.—*Irvin Axelrod, Office of Capital Goods, (202) 377-0310, September 1990.*

Additional References

(Call the Bureau of the Census at (301) 763-4100 for information about how to order Census documents.)

1987 Census of Manufacturers, Special Industry Machinery, Except Metalworking Machinery, SIC 3556, MC87-1-35D, Bureau of the Census, U.S. Department of Commerce, Washington, DC 20233. Telephone: (301) 763-4100.

Food Engineering, Chilton Company, Chilton Way, Radnor, PA 19089. Telephone: (215) 964-4000.

Food Processing, Putnam Publishing Company, 301 East Erie Street, Chicago, IL 60611. Telephone: (312) 644-2020.

Food Production Management, CTI Publications, Inc., 2619 Maryland Avenue, Baltimore, MD 21218-4576. Telephone: (301) 467-3338.

Processed Prepared Foods, Gorman Publishing Company, 8750 West Bryn Mawr Avenue, Chicago, IL 60631. Telephone: (312) 693-3200.

PACKAGING MACHINERY

Shipments of the packaging machinery (SIC 3565) industry declined less than 1 percent during 1990 below the previous year's shipments, measured in 1987 dollars. Total employment in the industry, which was comprised of 439 plants in 1987, remained static at 21,400 workers.

The largest packaging market remains the food packaging area, where over $350 billion of food products were shipped during 1990. There is a continued demand for more convenient and attractive packaging, better protection of contents from deterioration and tampering, and microwaveability, since more than three quarters of U.S. homes now possess microwave ovens. Controlled and modified atmosphere packaging is an established method in Western Europe for increasing product shelf life. It offers significant growth opportunities for flexible packaging. Since its recent introduction in the United States, new applications and material innovations for controlled and modified atmosphere packaging continue to appear at an ever-increasing pace.

Environmental concerns will present the major challenge to the packaging industry in the 1990s. Industry growth will be influenced by public debate over the volume of packaging materials in consumer waste. Countless bills were introduced at the federal, state, and local levels to restrict packaging materials in solid waste by requiring recycling or biodegradable plastics. Because of its impact on solid waste, packaging will be affected by stricter regulation. When ordering new equipment, many packagers select machinery that can handle recyclable—rather than biodegradable—packaging materials in order to meet waste management requirements. As a result, many food companies are actively supporting or investing in recycling centers in 1990s. An eventual decline in the volume of disposable packaging materials will lead to the use of more refillable packages and containers.

INTERNATIONAL COMPETITIVENESS

Packaging machinery exports in 1990 amounted to $585 million, a 20 percent increase over 1989 exports and equivalent to 23 percent of total product shipments. U.S. firms have been successful even in the domestic markets of their major international competitors—the United Kingdom, West Germany, Japan, and Italy. Canada continued as the largest market for U.S. packaging machinery in 1990 with purchases of approximately 28 percent of U.S. exports. Major markets, listed in declining order, were the United Kingdom, Mexico, West Germany, Japan, South Korea, Australia, France, Belgium, Brazil, and Italy. Export shipments reached a record high value in 1990 and represents the fifth consecutive year of increasing volume.

Packaging machinery imports were valued at about $589 million in 1990. This marked the third consecutive year of declining volume and approximately balanced the trade with exports. Italy, for the first time in history, replaced West Germany as the largest supplier to the United States. These two countries provided 55 percent of U.S. imports of packaging machinery. Japan and Canada were almost tied as the third and fourth largest suppliers. In descending order, other major sources of this equipment were Sweden, the United Kingdom, Switzerland, Denmark, France, and The Netherlands.

Outlook for 1991

Constant-dollar industry shipments of packaging machinery are forecast to rise 2.2 percent in 1991. Packaging equipment exhibiting particularly strong growth will include filling machines for packaging dry and viscous products and inert gases; units for aseptic packaging; and equipment for case forming, opening, sealing, thermoforming, and blister packaging. Declining consumer demand due to economic slowdown is expected to reduce investment in new machinery. Equipment purchases by pharmaceutical and chemical companies will outpace orders by food processors and cosmetic/toiletries manufacturers.

Long-Term Prospects

Packaging machinery shipments during 1991-95 are projected to increase 3.2 percent, compounded annually, as packagers strive to adjust their packaging methods and materials to meet consumer demands and legislative requirements. The trend toward greater use of electronics, robotics, and machine vision will continue through the 1990s. Packagers will seek to automate fully in the face of increasing labor costs and the need to produce a diverse range of products with relatively short life cycles, rather than mass-produced standard packaging items. Environmental issues and the demand for recyclable products will also influence the packaging machinery industry, perhaps reducing shipments. Packaging machinery exports will continue to rise steadily through the 1990s. U.S. firms are technologically advanced and competitive in manufactur-

Trends and Forecasts: Packaging Machinery (SIC 3565)

(in millions of dollars except as noted)

Item	1987	1988[1]	1989[2]	1990[2]	1991[3]	Percent Change 1987-88	1988-89	1989-90	1990-91
Industry Data									
Value of shipments[4]	2,190	2,106	2,482	2,593	2,650	−3.8	17.9	4.5	2.2
Value of shipments (1987$)	2,190	2,026	2,273	2,315	2,261	−7.5	12.2	1.8	−2.3
Total employment (000)	22.6	21.2	21.4	21.4	22.0	−6.2	0.9	0.0	2.8
Production workers (000)	13.4	12.4	12.6	12.4	13.2	−7.5	1.6	−1.6	6.5
Average hourly earnings ($)	12.30	12.63	13.00	13.39	—	2.7	2.9	3.0	—
Capital expenditures	54.4	33.5	—	—	—	−38.4	—	—	—
Product Data									
Value of shipments[5]	2,040	2,098	2,472	2,516	2,571	2.8	17.8	1.8	2.2
Value of shipments (1987$)	2,040	2,018	2,264	2,246	2,194	−1.1	12.2	−0.8	−2.3

[1] Advance data from the 1988 Annual Survey of Manufactures.

[2] Estimate.

[3] Forecast.

[4] Value of all products and services sold by establishments in the packaging machinery industry.

[5] Value of products classified in the packaging machinery industry produced by all industries.

SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA). Estimates and forecasts by ITA.

ing and marketing all major types of packaging machinery, especially in the application of sophisticated computer controls. Imports of packaging machinery and parts are expected to remain relatively unchanged.—*Irvin Axelrod, Office of Capital Goods, (202) 377-0310, September 1990.*

Additional References

(Call the Bureau of the Census at (301) 763-4100 for information about how to order Census documents.)

1987 Census of Manufacturers, General Industrial Machinery and Equipment, SIC 3565, MC87-1-35E, Bureau of the Census, U.S. Department of Commerce, Washington, DC 20230. Telephone: (301) 763-4100.

Food & Drug Packaging, Edgell Communications, 7500 Old Oak Boulevard, Cleveland, OH 44138. Telephone: (216) 243-8100.

Packaging, Cahners Publishing Company, Cahners Plaza, 1350 E. Touhy Avenue, P.O. Box 5080, Des Plaines, IL 60017-5080. Telephone: (708) 635-8800.

Packaging Digest, Delta Communications, Inc., 400 North Michigan Avenue, Chicago, IL 60611. Telephone (312) 222-2000.

TEXTILE MACHINERY

In 1990 shipments by the U.S. textile machinery industry increased about 6.5 percent in constant dollars. This growth was fueled by a favorable U.S. dollar exchange rate and a general expansion of the textile business worldwide. For the fourth year in a row exports grew at a high level and represented about 40 percent of U.S. product shipments in 1990.

Computerized systems and process controls are increasingly being applied to textile equipment, including machinery used for fiber-to-fabric processes, knitting, finishing, and yarn-preparing. The industry is in need of technical training for operators and maintenance personnel in the use of increasingly complex and sophisticated equipment. Manufacturers would also benefit from the collaboration of end-users, machinery builders, and suppliers of raw materials in the development of production processes.

Rising to the challenges posed by rising energy costs and continued competition from imports, many U.S. textile machinery companies continue to invest in high-technology process controls and sophisticated products such as dyeing and finishing machinery. To offset these expenses, many U.S. textile machinery producers made a strong effort to concentrate on export markets by exhibiting at major international shows, improving links to other countries and emphasizing service. These efforts, begun in the 1980s, have achieved good results over the last several years.

INTERNATIONAL COMPETITIVENESS

In 1990, U.S. exports of textile machinery were about $615 million in current dollars, a 12 percent increase over 1989. The major foreign markets for this machinery in 1990 were Canada, the United Kingdom, Soviet Union, Mexico, and Japan. The combined exports to these countries represented nearly half of the total foreign market for U.S. textile machinery. While China remains an important market, there has been a sharp decline in U.S. exports to China since the 1989 uprising.

U.S. imports of textile machinery in 1990 grew to about $1,552 million, in current dollars—an 11 percent increase over 1989. The imports originated primarily in West Germany, Japan, Italy, and Switzerland. The advanced technology incorporated into the foreign products and the aggressive marketing used to promote them in the United States have resulted in significant market penetration. The special financing packages offered to capital equipment buyers by foreign countries with competing textile machinery industries poses a continuing challenge to U.S. producers.

Outlook for 1991

U.S. textile machinery industry shipments in 1991 are projected to increase by about 3.5 percent in constant dollars. This growth will be spurred by U.S. textile machinery manufacturers aggressively marketing their products both domestically and overseas. Foreign sales would be stimulated in particular if there is a weaker dollar.

Sales prospects in the early months of 1991 may be dampened somewhat by the textile industry's tendency to delay purchasing decisions in the months before the ITMA exhibition, the large European trade show to be held in October 1991. The contracted Chinese market is not expected to gain much strength in 1991, but this will be partially offset by improvements in the Mexican market which has been stagnant for several years.

Domestic sales may lag in some areas, as a result of increased energy costs and expenditures for new technology.

Long-Term Prospects

The long-term outlook (1991-95) for the textile machinery industry is for an annual constant dollar growth rate of about 3.2 percent. Export markets will continue to be important in expansion of the industry.

Trends and Forecasts: Textile Machinery (SIC 3552)

(in millions of dollars except as noted)

Item	1987	1988[1]	1989[2]	1990[2]	1991[3]	Percent Change 1987-88	1988-89	1989-90	1990-91
Industry Data									
Value of shipments[4]	1,241	1,390	1,583	1,740	1,858	12.0	13.9	9.9	6.8
Value of shipments (1987$)	1,241	1,340	1,470	1,565	1,620	8.0	9.7	6.5	3.5
Total employment (000)	15.6	16.4	16.8	17.1	17.2	5.1	2.4	1.8	0.6
Production workers (000)	10.6	11.3	11.6	11.8	11.9	6.6	2.7	1.7	0.8
Average hourly earnings ($)	9.32	9.86	10.30	10.60	—	5.8	4.5	2.9	—
Capital expenditures	33.2	36.2	—	—	—	9.0	—	—	—
Product Data									
Value of shipments[5]	1,104	1,215	1,396	1,532	1,635	10.1	14.9	9.7	6.7
Value of shipments (1987$)	1,104	1,172	1,300	1,380	1,428	6.2	10.9	6.2	3.5

[1] Advance data from the 1988 Annual Survey of Manufactures.

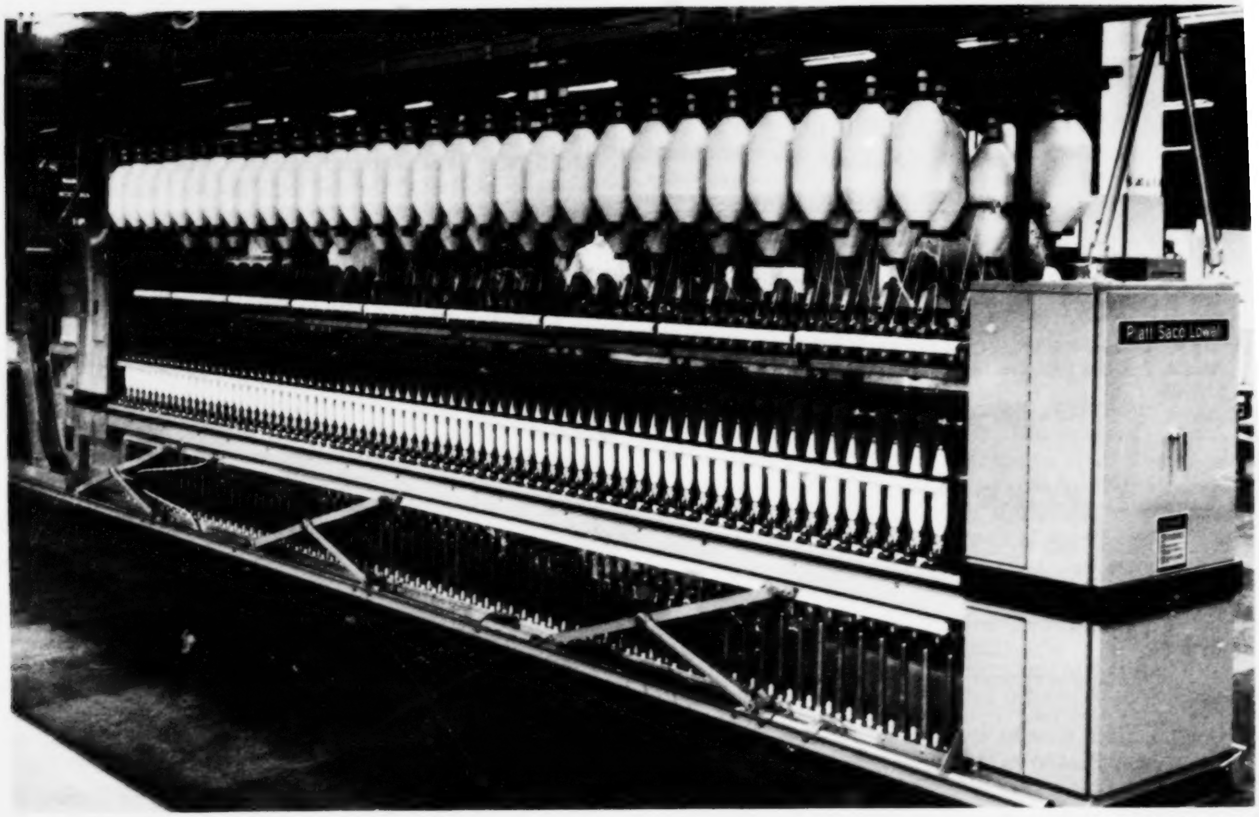
[2] Estimate.

[3] Forecast.

[4] Value of all products and services sold by establishments in the textile machinery industry.

[5] Value of products classified in the textile machinery industry produced by all industries.

SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA). Estimates and forecasts by ITA.



Platt Saco Lowell Corporation

This spinning equipment machine is an example of improved technology in the textile industry. Industry shipments are projected to increase by about 3.5 percent in 1991.

Foreign competition will continue to be a threat to the U.S. textile machinery industry. Over the next few years, increasing competition can be expected from Eastern European countries—Czechoslovakia and Poland, for example—which have good technology and low labor costs.

More computerization of systems and process controls require an emphasis on computer-to-computer communication links. Some U.S. textile machinery manufacturers have positioned themselves to be competitive in this area. U.S. dyeing and finishing equipment producers and makers of process control equipment remain highly competitive in technology. Even in the softening of the U.S. textile market, many firms continue to modernize as new systems become available.

The technological competitiveness of the U.S. textile machinery industry could be enhanced by proposed legislation. A bill introduced in the last Congress (HR 1461) would set aside a portion of tariffs collected on imported textile machinery for use by the industry to increase levels of research and development.—*Edward McDonald, Office of Capital Goods, (202) 377-0680, September 1990.*

Additional References

(Call the Bureau of the Census at (301) 763-4100 for information about how to order Census documents.)

1988 Annual Survey of Manufactures, M88, Bureau of the Census, U.S. Department of Commerce, Washington, D.C. 20233. Telephone: (301) 763-5752.

Special Industrial Machinery, Except Metalworking Machinery, 1987 Census of Manufactures, Industry Series MC87-I-35D, Bureau of the Census, U.S. Department of Commerce, Washington, D.C. 20233. Telephone: (202) 783-3238.

A Competitive Assessment of the U.S. Textile Machinery Industry, Capital Goods and International Construction Sector Group, International Trade Administration, U.S. Department of Commerce, Washington, DC 20230, January 1987. Telephone (202) 377-0680.

21

Electrical Equipment

The constant-dollar value of shipments by the electrical transmission, distribution, and industrial equipment industries will decline approximately 2.3 percent in 1991. During the 1991-95 period, shipments by these industries are expected to rise at a compound annual rate of about 2 percent.

Before reading this chapter, please see "How to Get the Most Out of This Book" on page one. It will clarify questions you may have concerning data collection procedures, factors affecting trade data, forecasting methodology, the use of constant dollars, the difference between industry and product data, source and references, and the Standard Industrial Classification system (SIC). For other topics related to this chapter, see chapters 5 (Construction) and 8 (Electric Lighting and Wiring Equipment).

POWER, DISTRIBUTION, AND SPECIALTY TRANSFORMERS

The major demand for power and distribution transformers comes from expansion and maintenance in the electric utility industry. Mirroring low levels of electric utility construction activity during 1990, the value of transformer industry (SIC 3612) shipments in 1987 dollars declined about 1.4 percent from a year earlier, as shown in the Trends and Forecasts table on page 21-2.

Transformer Orders

In 1989, electric utility expenditures for transmission and distribution (T&D) exceeded expenditures for generating plants for the first time since 1969. Although the turnaround signified more of a reduction in generation than a gain in T&D, power transformer orders did register gains for units rated 501 kilovolt-amperes (Kva) and above. The most recent data indicate that new orders in 1989 totaled 89,309 megavolt-amperes (MVA), and that the order backlog by January 1, 1990 was 71,212 MVA, up from totals of 83,872 MVA and 67,511 MVA, respectively, a year earlier. Activity appears shallow compared to 1974, when new orders reached a high of 293,012 MVA and the order backlog by the end of the year was 383,297 MVA. Shipments and new orders in 1990 were expected to show slight gains in current dollars. Table 1 shows selected transformer shipments for 1988 through 1990.

Table 1: Transformer Shipments, 1988–90

(in megavolt-amperes except as noted)

Power rating in kilovolt-amperes	1988		1989		1990[1]	
	Units	MVA	Units	MVA	Units	MVA
TOTAL[2]	5,646	76,891	6,207	81,314	3,535	60,964
501–10,000	4,567	11,534	5,121	13,428	2,669	7,570
10,001–30,000	692	18,020	672	17,287	533	11,825
30,001–100,000	291	19,300	324	21,320	246	14,674
100,001 and larger	96	28,036	90	29,279	87	26,895

[1] Total scheduled for shipment as of January 1, 1990.

[2] Data for transformers below 500 Kva not collected.

SOURCE: Edison Electric Institute.

PCB Rule Takes Effect

Polychlorinated biphenyls (PCBs) remain a major issue in the transformer industry. Liquids that have been used for years inside transformers to cool the coils and reduce the risk of fire, they have been under attack by environmental groups since the early 1970s because they do not break down in soil, and may cause cancer. Although PCBs decrease the chances of a transformer catching fire, if it does catch fire and explode, the PCBs are released into the atmosphere and become a long-lasting contaminant.

The Environmental Protection Agency's (EPA) "fire rule" concerning the use of PCBs in transformers took effect on October 1, 1990. Intended to reduce cancer and other risks that can result from a transformer fire, the new rule placed additional restrictions and conditions on the

Trends and Forecasts: Electrical Equipment (SIC 361, 3621, 3625)

(in millions of dollars except as noted)

Item	1987	1988[1]	1989[2]	1990[2]	1991[3]	Percent Change 1987-88	1988-89	1989-90	1990-91
Industry Data									
Value of shipments (1987$)	21,050	22,644	22,799	22,556	22,027	7.6	0.7	−1.1	−2.3
3612 Transformers	3,290	3,571	3,577	3,528	3,562	8.5	0.2	−1.4	1.0
3613 Switchgear & apparatus	4,907	5,323	5,294	5,334	5,412	8.5	−0.5	0.8	1.5
3621 Motors and generators	6,753	7,290	7,293	7,074	6,633	8.0	0.0	−3.0	−6.2
3625 Relays and controls	6,101	6,461	6,634	6,619	6,420	5.9	2.7	−0.2	−3.0

[1] Advance data from the 1988 Annual Survey of Manufactures.

[2] Estimate.

[3] Forecast.

SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA). Estimates and forecasts by ITA.

Trends and Forecasts: Transformers, Except Electronic (SIC 3612)

(in millions of dollars except as noted)

Item	1987	1988[1]	1989[2]	1990[2]	1991[3]	Percent Change 1987–88	1988–89	1989–90	1990–91
Industry Data									
Value of shipments[4]	3,290	3,650	3,942	4,100	4,346	10.9	8.0	4.0	6.0
Value of shipments (1987$)	3,290	3,571	3,577	3,528	3,562	8.5	0.2	−1.4	1.0
Total employment (000)	32.2	32.8	32.7	31.3	32.4	1.9	−0.3	−4.3	3.5
Production workers (000)	24.4	25.1	24.8	23.5	24.5	2.9	−1.2	−5.2	4.3
Average hourly earnings ($)	10.07	10.21	—	—	—	1.4	—	—	—
Capital expenditures	66.0	66.2	—	—	—	0.3	—	—	—
Product Data									
Value of shipments[5]	3,137	3,513	3,774	3,926	4,162	12.0	7.4	4.0	6.0
Value of shipments (1987$)	3,137	3,451	3,437	3,384	3,417	10.0	−0.4	−1.5	1.0

[1] Advance data from the 1988 Annual Survey of Manufactures.

[2] Estimate.

[3] Forecast.

[4] Value of all products and services sold by establishments in the transformers, except electronics industry.

[5] Value of products classified in the transformers, except electronic industry produced by all industries.

SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA). Estimates and forecasts by ITA.

continued use of transformers containing 500 parts per million or greater of PCBs. The ruling will affect approximately 77,568 PCB transformers in or near commercial buildings and 7,600 480-volt network PCB transformers with a high probability of fault-failure in use. The new regulations require that: (1) transformers installed in a radial configuration be protected from high and low current faults by October 1, 1990; and that (2) if the secondary-side voltage is greater than 480V, then the transformer must either be replaced or reclassified by October 1, 1990.

INTERNATIONAL TRADE

U.S. exports of transformer products during the first 6 months of 1990 amounted to $182.2 million. Major destinations were Canada and Mexico, with totals of $50.5 million and $41.5 million, respectively. Total world shipments rose 14 percent over the same period in 1989.

U.S. imports of foreign transformers during the same 6 month period totaled $300.1 million, an increase of about 9 percent over the first 6 months of 1989. Major suppliers to the United States were Mexico, $96.2 million; Canada, $36.0 million; West Germany, $28.9 million; and Taiwan, $28.4 million.

U.S. Exports and Imports
Electrical Equipment

(in millions of dollars except as noted)

SIC	Industry	1989	1990[1]	1991[2]	Percent Change 1989–90	1990–91
3612	Transformers, except electronic					
	Value of exports	287	350	365	22.0	4.3
	Value of imports	441	600	630	36.1	5.0
3613	Switchgear and switchboard apparatus					
	Value of exports	891	—	—	—	—
	Value of imports	1,690	—	—	—	—
3621	Motors and generators					
	Value of exports	1,483	—	—	—	—
	Value of imports	1,767	—	—	—	—
3625	Relays and industrial controls					
	Value of exports	368	—	—	—	—
	Value of imports	610	—	—	—	—
	Electrical Equipment					
	Value of exports	3,029	—	—	—	—
	Value of imports	4,506	—	—	—	—

[1] Estimate.

[2] Forecast.

SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA). Estimates and forecasts by ITA.

U.S. Trade Patterns in 1989
Electrical Equipment
SIC 361, 3621, 3625

(in millions of dollars, percent)

Exports	Value	Share	Imports	Value	Share
Canada & Mexico	1,088	35.9	Canada & Mexico	1,418	31.4
South America	162	5.3	South America	85.6	1.9
European Community	435	14.4	European Community	674	15.0
East Asia NICs	430	14.2	East Asia NICs	588	13.0
Japan	140	4.6	Japan	1,132	25.1
Other	775	25.6	Other	610	13.5
World Total	3,029	100.0	World Total	4,508	100.0
Top Five Countries					
	Value	Share		Value	Share
Canada	574	19.0	Japan	1,132	25.1
Mexico	513	17.0	Mexico	922	20.5
United Kingdom	164	5.4	Canada	496	11.0
Japan	140	4.6	West Germany	374	8.3
West Germany	117	3.9	Taiwan	229	5.1

See "How to Get the Most Out of This Book" for definitions of the Country Groupings.

SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA).

Outlook for 1991

Transformer shipments in 1991 will increase only about 1 percent in constant 1987 dollars. Although capital expenditures by electric utilities for transmission and distribution projects have registered recent gains, no strong upward pressure on construction budgets is anticipated in 1991.

Long-Term Prospects

Utilities throughout North America will continue to buy and sell electricity among themselves for both economy and reliability. Parts of bulk electric transmission systems in some areas of the country, therefore, may often be loaded to the limits of reliability by intersystem economy transfers that occur in addition to normal loading patterns. Although additional equipment will be needed in many regions to maintain reliability while accommodating growth, system expansion and upgrading continues to be hindered by complex regulations, difficulties in acquiring land, and court battles with environmental groups which claim that power lines generate electromagnetic fields that can cause cancer and have other adverse effects on humans and animals.

Only modest gains in U.S. transformer shipments are expected between 1991 and 1995. Shipments are expected to advance only 1 or 2 percent a year in constant dollar value.

SWITCHGEAR

The constant dollar value of shipments by the switchgear industry (SIC 3613) increased 1 percent in 1990. Switchgear products include switches, fuses, panelboards, distribution boards, and circuit breakers. These products are used in generation, transmission, and distribution systems primarily, for load switching and short-circuit protection; and in industrial and commercial power systems for protecting and controlling circuit loads.

Fuses

There are three distinct segments of the fuse market: electronic fuses, power fuses of 1,000 amps or less, and medium-voltage fuses of more than 1,000 amps. The electronic fuse area includes the auto, electronic, and defense markets; a major producer is Littlefuse, Inc. In the medium-voltage fuse market, major producers include the General Electric Co., Westinghouse Electric Corp., and S&C Electric Company. In the power fuse segment, the Bussman Division of Cooper Industries and Gould-Shawmut account for the major share of sales.

Circuit breakers have won the major share of the residential market, replacing fuses. The commercial and industrial markets use fuses and circuit breakers in about equal numbers.

In the last three years, three of the five major U.S. producers of power fuses were acquired by foreign manufacturers. In 1989, CEFCO, Inc. was bought by GEC Alsthom, a joint venture between General Electric Company of London and Companie Generale Electric of Paris. CEFCO is now a division of GEC's U.S. subsidiary, English Electric Corp., and is known as CEFCO-English Electric. The two other major acquisitions occurred when Japan's Nippon Mining Company bought Gould-Shawmut and when the Brush Fuse Division of London-based Hawker Siddeley bought Reliance Fuse Company.

A major problem U.S. fuse manufacturers face in establishing operations in Europe is that Great Britain, France, and West Germany all manufacture fuses to different standards. These countries may eventually work toward one standard, as part of their participation in EC92. EC92 is the merger of 12 Western European countries, which constitute a single market of 325 million people with a Gross Domestic Product of $4.5 trillion and a 1988 per capita income of $13,770. Although not expecting to be fully operational until 1992, the EC member countries are already gearing up for competition with other world markets.

Utility Circuit Breakers

Many utilities are gradually replacing air magnetic breakers on their systems with vaccuum breakers or sulfur hexafloride gas (SF6) insulated breakers. These new technologies require less maintenance and offer greater safety. SF6 is valuable to switchgear manufacturers because of its insulating and arc quenching properties. As an insulating medium, its high dielectric strength and nontoxic, nonflammable nature make it ideal for insulating many switchgear products.

INTERNATIONAL TRADE

In 1990, Mexico and Canada were the primary markets for various U.S. switchgear products, accounting for $348.5 million or 44 percent of total exports during the first 6 months. Mexico, Japan, and Canada were the primary exporters to the U.S. during the first half of 1990, accounting for $476.2 million or 57 percent of U.S. imports.

Outlook for 1991

Shipments of switchgear products are expected to increase about 1.5 percent in 1991 due primarily to equipment replacement demand. New nonresidential construction will continue to be depressed in 1991.

Long-Term Prospects

Growth in the demand for switchgear products is expected to be slow between 1991 and 1995. The real value of switchgear industry products is expected to grow a modest 1 or 2 percent a year during the period.

MOTORS AND GENERATORS

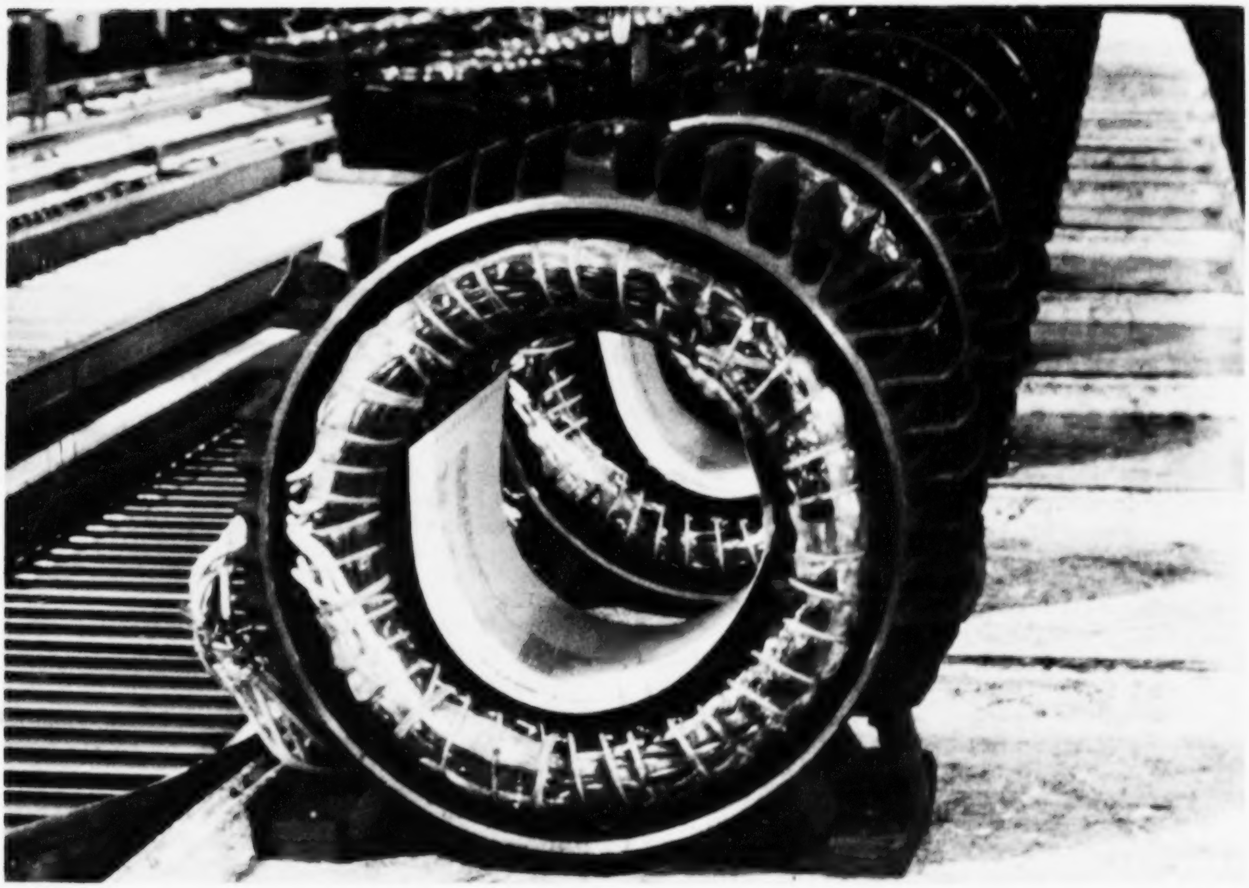
Shipments of the motor and generator industry (SIC 3621) declined 3 percent in real terms in 1990. Imports continued to outpace exports. During the first 6 months of 1990, U.S. imports amounted to $919 million, 2 percent higher than the corresponding period in 1989. Japan, Mexico, and Canada, in that order, were the primary exporters to the United States. U.S. exports during the first 6 months totaled $813 million, 7.5 percent greater than the same period in 1989. Canada and Mexico were the primary destinations for the U.S. products.

Emerson Electric, a major U.S. producer of electric motors, purchased Leroy-Somer S.A. of France, a major European motor manufacturer. The purchase was intended to strengthen Emerson Electric's position in the European Economic Community.

Also in 1990, Battelle Memorial Institute announced that it is developing a new fiberoptic sensor that detects weakening circuits in large power generators. Most sensors have difficulty operating in high-voltage machines. The new sensor will help prevent unscheduled downtime and costly brownouts by detecting hot spots to within 10 centimeters along stator bars in electric generators, enabling operators to make necessary corrections before a catastrophic failure. The new optical sensor will consist of a glass fiber coated with a special polymer and will not be affected by high voltage. The polymer will detect heat, and relay the information through the fiber. The sensor is being developed for the Electric Power Research Institute and Consolidated Edison Company of New York.

Outlook for 1991

Shipments by the motor and generator industry are expected to decline about 6 percent in constant 1987 dollars in 1991. The continuing weakness in both new housing and commercial construction, along with major competition from foreign motors, both as direct imports and as components of other imports, will prevent any growth in the demand for U.S. manufacturers' shipments.



Baldor Electric

The motor and generator industry is expected to grow at a compound annual rate of 2 percent between 1991 and 1995.

Long-Term Prospects

The motor and generator industry expects growth at a compound annual rate of 2 percent between 1991 and 1995. Demand for electric motors will increase in line with growth in U.S. industrial production and new construction activity. Foreign equipment will continue to fill much of the future demand.

INDUSTRIAL CONTROLS

Industrial controls are primarily products used for starting, regulating, stopping, and protecting electric motors. Shipments in 1990 by the relays and industrial controls industry (SIC 3625) declined very slightly in 1987 dollars. Due to the amount of European machinery that already exists or is being installed in U.S. industrial plants, a growing number of U.S. manufacturers now produce controls that meet International Electrotechnical Commission (IEC) standards. Those products can be sold offshore or used as replacement parts for the foreign machinery already installed in the United States. The low cost and space saving features of IEC-rated motor controls have helped them gain acceptance among U.S. engineers. Due to their smaller size, however, these controls cannot withstand short circuits as well as those rated by the National Electrical Manufacturers Association (NEMA). Therefore, they must be protected by current limiting devices.

INTERNATIONAL TRADE

Many U.S. electrical manufacturers have manufacturing and sales facilities offshore to take advantage of international market opportunities; many have joint venture and private labeling arrangements with foreign manufacturers to better meet foreign standards. Direct U.S. exports during the first half of 1990 totaled $186.2 million, a drop of 9.5 percent from the same period of 1989. This was due to increased international competition and internal economic factors of the importing countries (falloff in industrial production, etc.). Primary markets for the U.S. controls were Canada, $37.4 million; Mexico, $21.6 million; West Germany, $18.9 million; and the United Kingdom, $18.4 million. Imports during the first 6 months amounted to $355.3 million, up 10.5 percent over the similar period of 1989. Major exporters to the United States were Japan, $153.1 million; and Mexico, $72.7 million.

Outlook for 1991

Constant-dollar shipments by the relays and industrial controls industry are expected to decline about 3 percent in 1991, due to a weakening non-residential construction market and reduced industrial production.

Long-Term Prospects

Product shipments of this industry are expected to grow in real terms at a compound annual rate of 2 percent between 1991 and 1995.—*Richard A. Whitley, Office of Capital Goods, (202) 377-0682, October 1990.*

Additional References

(Call the Bureau of the Census at (301) 763-4100 for information about how to order Census documents.)

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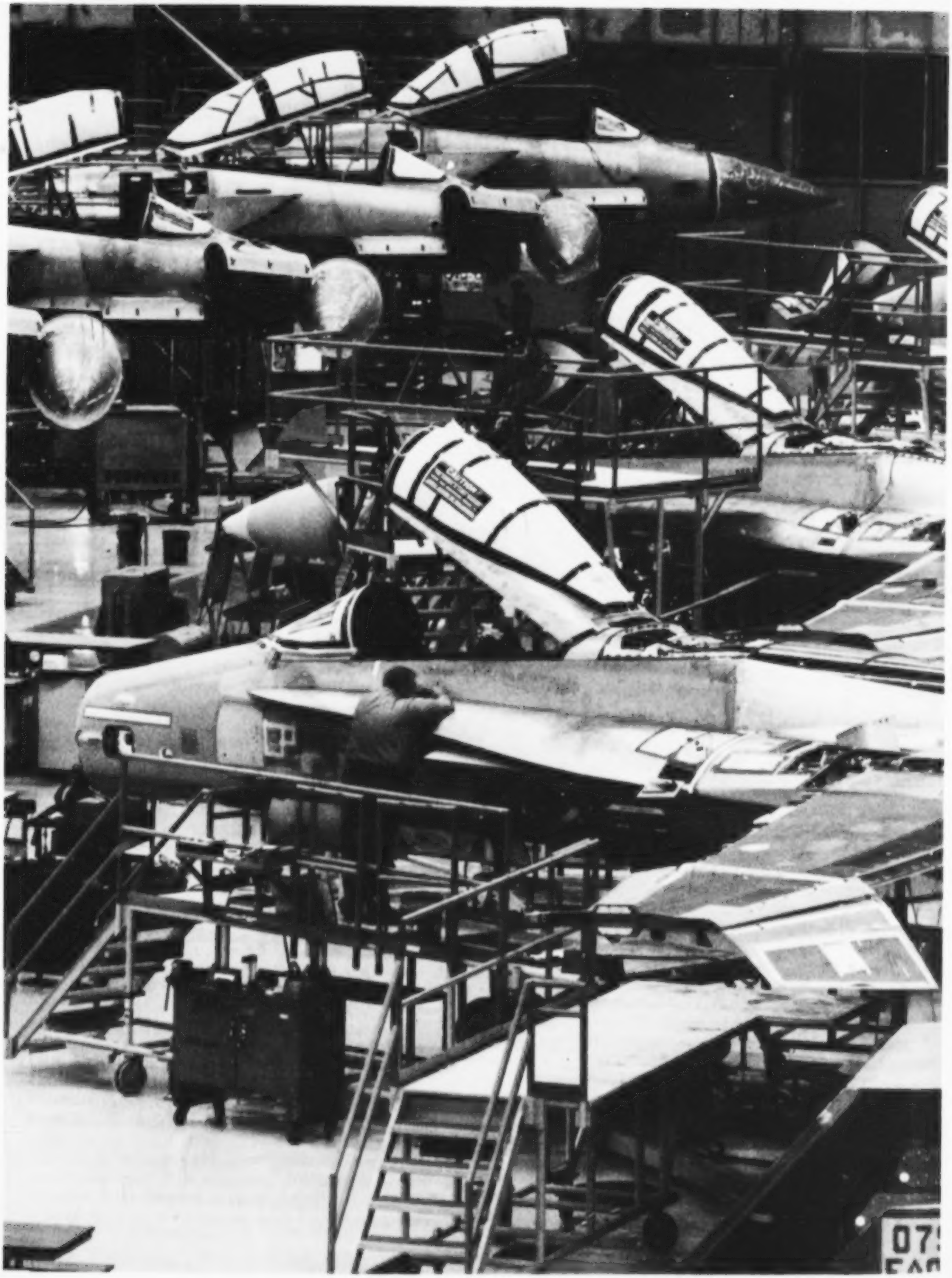

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Aerospace

The inflation-adjusted value of U.S. aerospace shipments is projected to climb 3.6 percent in 1991. Increasing manufacturing activity in the civil aircraft sector will offset declines in the military sector. Exports and imports are both expected to reach record highs of $42.9 billion and $11.2 billion, respectively. The decline in the labor-intensive military sectors will be reflected in the employment data, as the aerospace work force falls 1 percent in 1991 to a projected 806,800.

The aerospace industry, for purposes of this chapter, includes firms whose value of shipments and employment is classified under the following SIC categories: Aircraft (3721), Aircraft Engines and Engine Parts (3724), Aircraft Equipment, Not Elsewhere Classified (N.E.C.) (3728), Guided Missiles and Space Vehicles (3761), Guided Missile and Space Vehicle Propulsion Units and Parts (3764), and Guided Missile and Space Vehicle Equipment, N.E.C. (3769).

Before reading this chapter, please see "How to Get the Most Out of This Book" on page one. It will clarify questions you may have concerning data collection procedures, factors affecting trade data, forecasting methodology, the use of constant dollars, the difference between industry and product data, sources and references, and the Standard Industrial Classification system (SIC). For other topics related to this chapter, see chapter 31 (Radio Communications and Detection Equipment).

The current-dollar value of product shipments has doubled during this decade and is estimated to reach $120 billion in 1990. Steady worldwide sales of large commercial transport aircraft are sustaining the industry's growth. Between 1980 and 1990, the inflation-adjusted value of shipments grew at a compound annual rate of 3.6 percent.

Although the aerospace industry as a whole continues to grow, some sectors are not expanding. Declining defense budgets for aerospace products both in the United States and in other developed countries have reduced procurements of military aircraft and missile systems from U.S. suppliers. In addition, many foreign countries are becoming more self-sufficient in military aerospace equipment, thus reducing U.S. manufacturers' opportunities for export sales.

The shift in demand from the military to the civil aircraft sector is apparent in the business indicators published by the Bureau of the Census. In 1989, civil aircraft represented 74 percent of the total order backlog, while military aircraft accounted for the remaining 26 percent. This contrasts sharply with 1985, when the civil aircraft sector accounted for only 37 percent of the backlog.

INTERNATIONAL COMPETITIVENESS

Increased foreign demand for U.S. civil aircraft and the growing trend toward international industrial cooperation continue to foster more U.S. aerospace trade. In 1990, exports and imports of aerospace products climbed to record highs, with exports topping $35 billion for the first time ever. Exports of large commercial transport aircraft accounted for more than 40 percent of the total.

The aerospace sector remains one of the leading contributors to the plus side of the U.S. trade balance. Even though imports rose to an estimated $10.2 billion in 1990, the trade surplus hit an all-time high of about $28 billion. In 1991 the surplus is forecast to rise to $32 billion, mostly because of growing exports of widebody jets.

The enormous cost and high risk of new technology has stimulated a proliferation of cooperative programs between U.S. and foreign aerospace manufacturers. In both military and civil programs, U.S. manufacturers are relying more on

Trends and Forecasts: Aerospace (SIC 372,376)

(in millions of dollars except as noted)

Item	1987	1988[1]	1989[2]	1990[2]	1991[3]	Percent Change 1987-88	1988-89	1989-90	1990-91
Industry Data									
Value of shipments[4]	103,563	108,678	101,971	119,820	127,642	4.9	−6.2	17.5	6.5
Value of shipments (1987$)	103,563	111,565	101,864	114,981	119,137	7.7	−8.7	12.9	3.6
Total employment (000)	809	832	831	814	807	2.8	−0.1	−2.0	−0.9
Production workers (000)	407	399	397	393	389	−2.0	−0.5	−1.0	−1.0
Average hourly earnings ($)	14.92	15.00	—	—	—	0.5	—	—	—
Capital expenditures	3,611	3,401	—	—	—	−5.8	—	—	—
Product Data									
Value of shipments[5]	97,169	102,620	95,652	112,989	116,232	5.6	−6.8	18.1	2.9
Value of shipments (1987$)	97,169	105,405	93,846	108,365	108,467	8.5	−11.0	15.5	0.1

[1] Advance data from the 1988 Annual Survey of Manufactures.

[2] Estimate.

[3] Forecast.

[4] Value of all products and services sold by establishments in the aerospace industry.

[5] Value of products classified in the aerospace industry produced by all industries.

SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA). Estimates and forecasts by ITA.

Table 2: U.S. Exports of Aerospace Vehicles and Equipment, 1987–91

(values in millions of dollars)

Items	1987		1988		1989[1]		1990[2]		1991[3]	
	Units	Value	Units	Value	Units	Value	Units	Value	Units	Va
Aerospace vehicles and equipment	—	23,452	—	26,915	—	32,884	—	40,957	—	49,
Civilian aircraft	1,812	7,518	2,784	10,294	3,940	14,257	4,051	19,519	4,641	24,
Under 4,536 kg. unladen weight, new	473	254	619	298	1,638	265	1,246	308	1,400	2
4,536–15,000 kg. unladen weight, new	15	42	24	49	48	164	77	227	92	2
Over 15,000 kg. unladen weight, new	170	6,377	217	8,766	260	13,122	300	17,878	600	23,0
Rotocraft, new	240	200	280	219	294	156	364	133	382	1
Other aircraft, N.E.C., new	—	141	—	323	—	18	—	12	—	
Used or rebuilt	914	504	1,644	639	1,700	533	2,064	961	2,167	9
Military aircraft	—	3,587*	—	2,157	846	892	422	1,762	432	2,0
New	—	3,583*	—	2,098	647	836	372	948	387	1,3
Used	18	4*	125	59	199	56	50	814	45	7
Aircraft engines and parts	—	4,396	—	5,420	—	6,629	—	6,710	—	7,9
Piston engines and parts	—	352	—	389	—	438	—	423	—	41
Complete engines, new and used	3,099	57	6,260	57	8,653	131	6,424	115	6200	11
Engine parts	—	296	—	332	—	307	—	308	—	30
Turbine engines and parts	—	4,044	—	5,031	—	6,191	—	6,287	—	7,49
Complete engines, new and used	1,831	1,322	2,486	1,705	3,917	2,053	3,286	1,836	4,200	2,48
Engine parts	—	2,722	—	3,326	—	4,138	—	4,452	—	5,00
Propellers and parts	—	47	—	75	—	271	—	310	—	37
Landing gear and parts	—	131	—	125	—	273	—	264	—	31
Aircraft parts, N.E.C	—	6,497	—	7,228	—	8,198	—	9,421	—	10,36
Avionics	—	323	—	401	—	732	—	733	—	85
Flight simulators	—	107	—	159	—	206	—	209	—	23
Guided missiles and parts	—	389	—	434	—	1,042	—	1,429	—	1,644
Space launch equipment	—	457	—	622	—	384	—	600	—	82

Note: Totals do not correspond to SIC-based trade statistics because of slightly broader coverage. Data shown for certain products for 1989–1990 are not comparable to previous years because of category changes made under the Harmonized System.

[1] Revised.

[2] Estimate.

[3] Forecast.

*Military aircraft exports were adjusted in accordance with a 1987 errata published by the Bureau of the Census.

SOURCE: U.S. Department of Commerce, Bureau of the Census. Estimates and forecasts by the International Trade Administration.

foreign technology, manufacturing facilities, and capital to develop and market new products. This globalization is a long-term trend, and many of the cooperative projects will not be completed in this decade.

As U.S. companies rely on foreign subsystems for use in U.S.-made aircraft or engines, imports rise (Table 3). U.S. purchases of foreign aircraft engines and aircraft parts totaled $7.3 billion in 1990 and accounted for 70 percent of total aerospace imports. In 1991, engines and parts are expected to grow to almost $7.7 billion. Imports of complete aircraft will also rise appreciably in 1991, as Airbus Industries recovers from the 1990 strike at British Aerospace and Fokker continues deliveries of the F-100 transport aircraft. Imports of business and commuter aircraft from Brazil, Canada, and Europe will continue to add more than $1 billion to aerospace imports.

Outlook for 1991

Industry indicators point to slower growth in U.S. aerospace sales in 1991. In January through July 1990, manufacturers added $79.8 billion to their order books, down 14

Table 3: U.S. Imports of Aerospace Vehicles and Equipment, 1987–91

(values in millions of dollars)

Items	1987		1988		1989[1]		1990[2]		1991[3]	
	Units	Value	Units	Value	Units	Value	Units	Value	Units	Value
Aerospace vehicles and equipment, total	—	8,046	—	9,092	—	10,508	—	10,792	—	12,208
Civilian aircraft	540	2,159	602	2,703	1,591	2,775	1,470	2,702	1,408	3,426
Under 4,536 kg. unladen weight, new	131	220	117	175	1,127	142	1,082	324	1,020	360
4,536–15,000 kg. unladen weight, new	167	1,187	152	1,194	131	1,018	151	1,194	177	1,397
Over 15,000 kg. unladen weight, new	23	603	25	1,125	36	1,282	29	800	34	1,272
Rotocraft, new	99	80	114	104	124	103	89	90	97	100
Other aircraft, N.E.C., new	—	6	—	13	—	2	—	2	—	2
Used and rebuilt	120	63	194	92	173	228	64	292	80	295
Military aircraft	114	25	27	2	29	16	35	23	34	24
Aircraft engines and parts	—	2,789	—	2,877	—	3,910	—	4,036	—	4,449
Piston engines and parts	—	35	—	22	—	184	—	119	—	98
Complete engines, new and used	2,584	15	—	8	2,833	43	—	42	—	35
Engine parts	—	20	—	14	—	141	—	77	—	63
Turbine engines and parts	—	2,754	—	2,855	—	3,726	—	3,917	—	4,351
Complete engines, new and used	1,756	1,323	2,600	1,052	2,283	1,921	3,823	1,684	3,000	1,750
Engine parts	—	1,431	—	1,803	—	1,805	—	2,233	—	2,601
Aircraft parts, N.E.C	—	2,587	—	3,049	—	3,339	—	3,428	—	3,634
Avionics	—	308	—	—	—	252	—	278	—	305
Flight simulators	—	142	—	109	—	68	—	182	—	218
Guided missiles and parts	—	—	—	42	—	118	—	101	—	100
Space launch equipment	—	36	—	310	—	30	—	42	—	52

Note: Totals do not correspond to SIC-based trade statistics because of slightly broader coverage. Data shown for certain products for 1989–1991 are not comparable to previous years because of category changes made under the Harmonized System.

[1] Revised.

[2] Estimate.

[3] Forecast.

SOURCE: U.S. Department of Commerce, Bureau of the Census. Estimates and forecasts by the International Trade Administration.

U.S. Exports and Imports
Aerospace
(in millions of dollars except as noted)

SIC	Industry	1989	1990[1]	1991[2]	Percent Change 1989-90	Percent Change 1990-91
3721	Aircraft					
	Value of exports	14,339	20,399	23,459	42.3	15.0
	Value of imports	2,805	2,778	3,450	−1.0	24.2
3724	Aircraft engines and engine parts					
	Value of exports	6,779	6,845	7,400	1.0	8.1
	Value of imports	4,006	4,245	4,449	6.0	4.8
3728	Aircraft parts and equipment, nec					
	Value of exports	8,914	9,545	10,220	7.1	7.1
	Value of imports	2,920	3,066	3,220	5.0	5.0
3761	Guided missiles and space vehicles					
	Value of exports	396	653	980	64.9	50.1
	Value of imports	6.9	4.6	5.0	−33.3	8.7
3764	Space propulsion units and parts					
	Value of exports	13.2	49.2	98.4	272.7	100.0
	Value of imports	2.8	0.2	0.5	−92.9	150.0
3769	Space vehicle equipment, nec					
	Value of exports	666	701	750	6.9	7.0
	Value of imports	110	86.2	90.0	−21.6	4.4
	Aerospace					
	Value of exports	31,097	38,193	42,907	22.8	12.3
	Value of imports	9,850	10,180	11,215	3.4	10.2

[1] Estimate

[2] Forecast

SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA). Estimates and forecasts by ITA.

percent from the corresponding 1989 period. The decline in orders does not yet threaten the expansion of the industry, since the manufacturers still have a huge backlog. In July 1990, unfilled orders stood at $234.9 billion, enough to keep factory floors busy at existing production rates for 20 months. Two firms, Boeing and McDonnell Douglas, account for almost one-half of the backlog.

Aerospace manufacturers will ship products valued at about $127 billion in 1991, a real increase of 3.6% over 1990. Large jet aircraft production will lead industry growth with shipments of almost $28 billion. Growth in aircraft production will help boost aircraft engine and component shipments, forecast to be almost $44 billion, a real increase of 3 percent over 1990. Growth in these areas as well as in the general aviation and space sectors will partially offset the expected decline in military aircraft and missiles.

U.S. Trade Patterns in 1989
Aerospace
SIC 372, 376
(in millions of dollars, percent)

Exports	Value	Share	Imports	Value	Share
Canada & Mexico	2,464	7.9	Canada & Mexico	1,918	19.5
South America	1,104	3.5	South America	196	2.0
European Community	10,138	32.6	European Community	2,828	28.7
East Asia NICs	4,493	14.4	East Asia NICs	204	2.1
Japan	2,564	8.2	Japan	481	4.9
Other	10,333	33.2	Other	4,223	42.9
World Total	31,097	100.0	World Total	9,850	100.0
Top Five Countries					
	Value	Share		Value	Share
United Kingdom	3,349	10.8	France	3,254	33.0
West Germany	3,075	9.9	United Kingdom	1,978	20.1
France	2,651	8.5	Canada	1,839	18.7
Japan	2,564	8.2	Japan	481	4.9
Canada	1,987	6.4	West Germany	434	4.4

See "How to Get the Most Out of This Book" for definitions of the Country Groupings.

SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA).

Table 1: Aerospace Industry Earnings Compared with Earnings of All Manufacturing Industries, 1970–89

Year	Profits After Taxes as Percent of Net Sales: Aerospace Industry	Profits After Taxes as Percent of Net Sales: All Manufacturing	Profits After Taxes as Percent of Stockholders' Equity: Aerospace Industry	Profits After Taxes as Percent of Stockholders' Equity: All Manufacturing
1971	1.8	4.1	5.8	9.7
1972	2.4	4.4	7.9	10.6
1973	2.9	4.7	10.2	13.1
1974	2.9	5.5	10.5	14.9
1975	3.0	4.6	11.0	11.6
1976	3.4	5.4	12.3	13.5
1977	4.2	5.3	13.3	13.6
1978	4.4	5.4	15.9	15.0
1979	5.1	5.7	17.0	15.8
1980	4.3	4.9	16.0	13.9
1981	4.4	4.7	15.9	13.6
1982	3.2	3.5	11.4	9.2
1983	3.5	4.1	12.2	10.6
1984	4.1	4.6	14.1	12.5
1985	3.0	3.8	10.8	10.1
1986	2.7	3.7	9.2	9.5
1987	4.1	4.9	14.5	12.8
1988	4.3	6.0	15.0	16.2
1989	3.3	5.0	10.5	13.5

SOURCE: "Quarterly Financial Report for Manufacturing Corporations," U.S. Department of Commerce and the Federal Trade Commission.

Many aerospace companies are cutting back on employment, as military programs are delayed or terminated. Companies such as McDonnell Douglas, Lockheed, Grumman, General Dynamics, and Northrop have announced plans to eliminate thousands of jobs. Despite some relocation to the civil side of the industry, it is not enough to prevent total aerospace employment from declining 2 percent in 1990. A further 1 percent decline is expected in 1991.

The U.S. aerospace sector leads all other industries in expenditures for research and development (R&D). The National Science Foundation (NSF) estimated that total R&D expenditures on U.S. aerospace projects reached $25 billion in 1988. The U.S. Government funds a substantial share of aerospace R&D to encourage basic research, generic product development, and improvements in flight safety. However, U.S. companies are shouldering a growing share of total R&D. Since 1977, the NSF reports that company-funded R&D increased at an annual rate of 11.6 percent, while government-funded R&D grew by 9.2 percent. The decline in military budgets may further reduce the share of government-funded R&D.

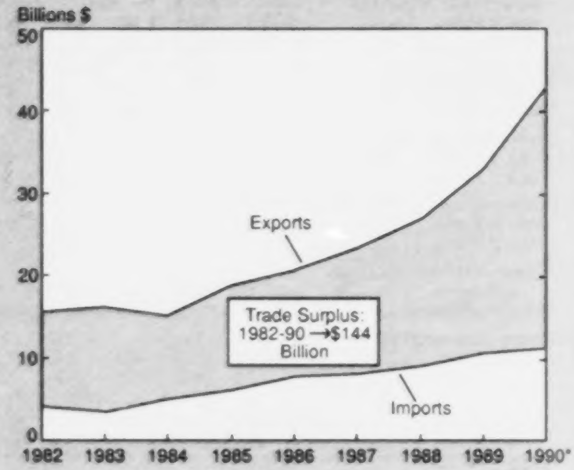
Commerce Department figures indicate that the aggregated financial profile for the U.S. aerospace industry did not improve in 1989. The industry reported profits of $3.9 billion in 1989 on total revenues of $118.2 billion. Profits as a percent of sales—a good measure of operating efficiency—decreased from 4.3 to 3.3 percent (Table 1). Profits as a percent of stockholders' equity, which reflects the return on actual financial investment, fell from 15.0 percent to 10.5 percent. The industry's 1989 financial performance was lower than in 1987 and 1988 and fell short of the combined average for all manufacturing industries.

Long-Term Prospects

The changing complexion of the U.S. aerospace business makes it difficult to predict financial performance. Increasing shipments of large commercial aircraft should bring a gradual increase in profit margins for that sector. Conversely, declining defense budgets mean lower production rates for many military programs, resulting in lower production efficiencies and reduced financial returns. Several U.S. defense firms are sustaining losses under firm fixed-price development contracts, which also will affect profits reported in 1990 and 1991.

Overall, analysts are cautiously optimistic about the aerospace industry's long-term outlook. Airline expansion and the gradual retirement of older aircraft through the decade assure long-term growth in the civil transport sector. Growth will be threatened only if fuel prices persist at their current high levels. The Iraqi crisis served to moderate the pace of delays and terminations in the military aircraft and missile programs. Fast growth in the commercial space sector will make it a more important factor in the future. Assuming continuing improvements in U.S. aerospace technology and open markets overseas, the aerospace industry should remain strong, with an average annual real growth rate of 3 percent through 1995.

Figure 22-1
U.S. Aerospace Trade



* Estimated.
Source: U.S. Department of Commerce, International Trade Administration.

AIRCRAFT

The large transport aircraft sector includes all passenger and cargo aircraft weighing more than 15,000 kilograms. A large backlog and increasing production rates for large transport aircraft ensure a healthy near-term market, though the backlog is unlikely to grow as fast through 1991 as during the 1987-1990 period.

Manufacturers of large commercial transport in the United States and Europe continue to increase production rates in response to the large backlog of orders. The combined backlog of Boeing and McDonnell Douglas was almost $100 billion at the end of June, 1990. During the first six months of 1990, these two manufacturers received 343 net orders (firm orders less cancellations) valued at nearly $17.7 billion. This represents a decrease of 28 percent from the record in the first half of 1989. During the same period in 1990, Airbus received approximately 118 orders, a decrease of 50 percent from the first half of 1989.

This moderation in orders was not unexpected, reflecting, as it does, the cyclical pattern of the large transport aircraft market. U.S. domestic airline traffic was flat in 1990 and U.S. airline profitability fell. International traffic remained strong, but higher fuel prices led to higher ticket prices, threatening to reduce international traffic as well. The combination of lower traffic growth and lower airline profitability discouraged airlines from further expansion. New orders will continue to be down in 1991, as Boeing and McDonnell Douglas begin to work off their large backlogs. The backlog itself should not be vulnerable to significant cancellations unless fuel prices remain at, or continue to escalate from, their current high levels.

Boeing and McDonnell Douglas delivered about 536 large commercial aircraft in 1990 with a value of approximately $21.9 billion, an increase of 45 percent from 1989. One reason for the large percentage increase is the low level of 1989 deliveries because of a strike at Boeing in the fourth

Trends and Forecasts: Aircraft (SIC 3721)

(in millions of dollars except as noted)

Item	1987	1988[1]	1989[2]	1990[2]	1991[3]	Percent Change 1987-88	1988-89	1989-90	1990-91
Industry Data									
Value of shipments[4]	39,093	41,154	36,713	47,286	51,636	5.3	−10.8	28.8	9.2
Value of shipments (1987$)	39,093	42,037	35,923	44,275	46,942	7.5	−14.5	23.2	6.0
Total employment (000)	268	279	281	268	265	4.1	0.7	−4.6	−1.1
Production workers (000)	142	142	143	141	139	0.0	0.7	−1.4	−1.4
Average hourly earnings ($)	15.38	16.01	16.83	17.70	—	4.1	5.1	5.2	—
Capital expenditures	1,052	1,036	—	—	—	−1.5	—	—	—
Product Data									
Value of shipments[5]	36,003	36,477	33,042	42,557	46,472	1.3	−9.4	28.8	9.2
Value of shipments (1987$)	36,003	37,221	32,268	39,773	42,171	3.4	−13.3	23.3	6.0

[1] Advance data from the 1988 Annual Survey of Manufactures.
[2] Estimate.
[3] Forecast.
[4] Value of all products and services sold by establishments in the aircraft industry.
[5] Value of products classified in the aircraft industry produced by all industries.

SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA). Estimates and forecasts by ITA.

Table 4: Shipments of Complete U.S. Aircraft, 1971–91

(values in millions of dollars)

Year	Aircraft total		Civil								Military	
			Total		Large Transports		General Aviation[1]		Rotorcraft			
	Units	Value	Units	Value	Units	Value	Units	Value	Units	Value	Units	Value
1971	11,161	6,593	8,142	2,971	223	2,580	7,466	322	453	69	3,019	3,622
1972	13,072	6,220	10,542	3,417	199	2,787	9,774	558	569	72	2,530	2,803
1973	16,539	8,176	14,688	4,814	274	3,873	13,646	828	768	113	1,851	3,362
1974	17,192	8,595	15,292	5,270	317	4,207	14,166	909	809	154	1,900	3,325
1975	16,918	9,355	15,179	5,306	285	4,006	14,056	1,033	838	266	1,739	4,050
1976	17,865	9,001	16,489	4,705	217	3,155	15,451	1,226	821	324	1,376	4,296
1977	19,392	9,092	18,047	4,512	159	2,672	16,904	1,488	984	352	1,345	4,580
1978	19,881	10,179	18,885	6,460	241	4,308	17,811	1,781	833	371	996	3,719
1979	19,302	15,028	18,465	10,598	376	8,030	17,048	2,165	1,041	403	837	4,430
1980	14,660	18,845	13,613	12,953	383	9,793	11,877	2,486	1,353	674	1,047	5,892
1981	11,860	20,157	10,798	13,287	388	9,731	9,457	2,920	953	636	1,062	6,870
1982	6,248	19,266	5,089	8,619	236	6,254	4,266	2,000	587	365	1,159	10,647
1983	4,409	23,012	3,356	10,266	262	8,493	2,691	1,470	403	303	1,053	12,746
1984	3,931	22,570	2,995	8,354	188	6,343	2,431	1,681	376	330	936	14,216
1985	3,597	28,988	2,678	10,987	273	9,051	2,029	1,431	376	505	919	18,001
1986	3,261	35,145	2,154	12,193	329	10,643	1,495	1,262	330	288	1,107	22,952
1987	3,003	36,008	1,804	12,226	361	10,585	1,085	1,364	358	277	1,199	23,777
1988	3,202	35,683	2,017	15,845	422	13,588	1,212	1,923	383	334	1,185	17,838
1989	3,471	30,902	2,448	17,129	398	15,074	1,535	1,804	515	251	1,023	13,773
1990[2]	3,215	39,794	2,232	25,321	524	23,200	1,118	1,921	590	200	983	14,473
1991[3]	3,211	43,455	2,410	29,834	610	27,555	1,200	2,075	600	204	801	13,621

[1] Excludes off-the-shelf military aircraft.

[2] Estimate.

[3] Forecast.

SOURCE: U.S. Department of Commerce, International Trade Administration (ITA); general aviation (through 1989), General Aviation Manufacturers Association; rotorcraft (through 1989), Aerospace Industries Association. Estimates and Forecasts by ITA.

quarter. Approximately 600 commercial aircraft are forecast to roll out of U.S. factory doors in 1991, more than three times the number delivered in 1984.

U.S.-produced jet transports are highly popular in foreign markets. At the end of 1989, foreign airlines operated 3,641 U.S. transport aircraft, almost 80 percent of the total foreign fleet. Boeing and McDonnell Douglas exported more than half of their combined output of commercial aircraft in 1990. Fifty percent of those exported aircraft went to the European Community. Pacific Rim countries accounted for an additional 27 percent of U.S.-exported aircraft.

Foreign large transport aircraft producers are carving out a significant share of the world market. During 1989, European manufacturers accounted for 33 percent of the total value of world orders, with Boeing and McDonnell Douglas accounting for the remaining 67 percent. Airbus delivered 105 aircraft in 1989, and the company plans to boost its annual production rate to 200 aircraft by 1993. However, the consortium fell short of its anticipated 1990 schedule because of a strike at British Aerospace, and delivered only 120 aircraft valued at approximately $5.4 billion. British Aerospace and Fokker delivered an estimated 100 large transport aircraft worth $2 billion in 1990. The Soviet Union is demonstrating better technical capabilities in civil transport aircraft development, and represents a future competitor in the export market.

Imports of foreign large transport aircraft fell in 1990, with major U.S. airlines taking delivery of an estimated 29 foreign aircraft valued at $800 million. Imports accounted for about 14 percent of the total value of large commercial jets acquired by U.S. airlines in 1990, down from 20 percent in 1989. The strike at British Aerospace and resultant delays in Airbus deliveries contributed to the decline. Imports are likely to grow in 1991 and beyond with the increase in Airbus A320 and Fokker 100 deliveries to U.S. airlines and with the introduction of the Airbus A330 and A340 in 1992. These four new models alone could add 190 aircraft worth almost $6 billion to U.S. imports over the next three years.

U.S. transport manufacturers continue to devote substantial funds to R&D to maintain their lead position in the world marketplace. Currently they are focusing on the development of derivative aircraft, using more advanced engines, electronics, and materials to enhance the operating efficiency and reliability of existing airframes.

In 1989, McDonnell Douglas rolled out the first MD-11 widebody—a derivative of the DC-10—with first delivery in 1990. McDonnell Douglas also has taken orders for the MD-90 series of aircraft, the successor to the MD-80. At Boeing, engineers are working on a stretched version of the popular 767-300 widebody, the 767X. Increasing fuel prices may renew interest in—and accelerate development of—unducted fan propulsion technology for large transport aircraft.

General Aviation

Manufacturers of general aviation aircraft produce fixed-wing aircraft for business transportation, regional airline service, and recreation, utility, and training purposes. In 1990, the number of aircraft shipments in this category declined again, after a two-year recovery from the slump that has characterized this sector since 1980. The decline in shipments is the result of continuing problems in the piston-powered segment of the general aviation market. This weakness was offset, however, by growth in the higher value turbine-powered segment, increasing the value of shipments in 1990 by about 5 percent. The strength of the turbine market should continue to support the general aviation sector in 1991.

Piper Aircraft, which produced half of this country's piston-powered aircraft in 1989, led the short recovery in 1988 and 1989 with aggressive marketing of its small airplanes. In

Airline expansion and gradual retirement of older planes through the decade assure long-term growth in the civil transport sector.

1990, serious financial difficulties cut the company's production rate to less than one-fourth of its 1989 rate. Total piston-powered airplane deliveries in 1990 dropped to 700 aircraft, down 25 percent from 1989. Demand for these aircraft may be stimulated in 1991 if Congress enacts product liability legislation. High product liability costs for owners and manufacturers of small airplanes have been a major factor in the sector's decade-long slump.

In dollar terms, turboprop and turbofan airplanes, used primarily in corporate fleets, accounted for more than 90 percent of annual general aviation shipments in 1990. Turboprops and small- and medium-sized jets continue to be the strongest areas of this segment, with backlogs that stretch into 1992. Low inventories and high prices for used aircraft, strong foreign demand, and an aging corporate fleet will provide stability in this market. Production rates of current models are unlikely to increase significantly in 1991. Producers are wary of a potential reduction in demand resulting from rising jet fuel prices and falling corporate profits.

Newly introduced turbine-powered general aviation aircraft are stimulating this segment of the industry. Recent models, such as Beech's 350 King Air and Cessna's Citation V, make up a significant share of the backlog at the two companies. The CitationJet, announced at the end of 1989, through 1991. Sales of new technology aircraft like Starship are expected to increase in 1991.

Overall general aviation shipments are forec crease in 1991 to $1.9 billion.

U.S. general aviation exports accounted fo percent of the total value of 1990 shipments. Th exports increased more than 10 percent from 198 driven by shipments of turbine-powered airplan eign customers. In the past few years, foreign co has grown in the piston-powered and the large b segments, but the lower dollar and competitive high quality, American-made turbine-powered air sustain the current level of U.S. exports of gener aircraft through 1991.

Despite the increase in exports, the general av tor recorded its tenth consecutive trade deficit Imports grew more than 30 percent from 1989 than $1.5 billion in 1990, and now account for general aviation airplanes delivered to U.S. Growth in the U.S. aircraft market for regional a the biggest contributor to the increase in imp

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manufacturers have almost no aircraft models in this category. Imports of 20- to 70-seat planes from Brazil, Canada, and Europe increased almost 40 percent over 1989. Increased imports of large business jets from Canada and France also were a big factor in the growth of imports.

Imports will continue to grow in 1991, with the U.S. regional airlines already scheduled to take delivery of larger quantities of foreign aircraft. U.S. regional airlines such as AMR Eagle, Comair, and Westair have ordered large quantities of current aircraft models, such as the ATR42/72, the BAe Jetstream, Embraer Brasilia, and Saab 340. Deliveries will stretch out into the middle of the 1990s. Two new foreign models, the Canadair RJ and the Embraer EMB-145, have attracted a lot of interest from U.S. airlines. These 45- to 50-seat turbofan-powered aircraft are targeted for use on long, low- density routes and hub bypass operations by regional airlines. These two aircraft will add to imports of general aviation equipment when deliveries begin in 1992.

Demand for Civil Helicopters

U.S. manufacturers are encouraged by increased demand for new civil helicopters. Total civil helicopter deliveries increased from 515 in 1989 to almost 600 aircraft in 1990, though the value of shipments declined for the second year.

The driving force behind the rise in unit sales in 1989 and 1990 has been the success of small piston-powered helicopters. These helicopters, manufactured by Robinson Helicopter, Schweizer Aircraft, and Enstrom Helicopter accounted for almost 90 percent of all U.S. shipments, up from 70 percent in 1988. The trainer market and foreign demand have stimulated the high production of these rotorcraft. Half of the piston-powered helicopters were exported during 1990, with a value of close to $40 million. With the lower dollar stimulating expanding foreign demand, 1991 should be another growth year for this market segment.

Civil turbine helicopter shipments declined 15 percent in 1990. Demand from emergency medical services, the media, and police departments did not offset the lower demand caused by the continuing slump in the offshore oil industry. Strong competition from manufacturers in France, Italy, and Germany also had an impact on international and domestic sales.

A turnaround in turbine-powered rotorcraft is anticipated in 1991. Unusually low inventories of used helicopters with correspondingly high prices will make new rotorcraft more attractive to buyers. Expected sales of surplus military helicopters to civilian markets are less likely because of budget constraints that will reduce the Army's ability to procure new-technology helicopters. The offshore oil industry represents the largest potential market, and a recovery of offshore activity is likely in the wake of the Iraqi invasion of Kuwait. The introduction of new models such as the Bell 412SP, MD-520N, MDX, and the Sikorsky 76C, will also stimulate the market. The forecast for 1991 helicopter shipments is for 600 rotorcraft at a value of $204 million.

One key to the future of the helicopter sector will be the development of a civil tiltrotor. A congressional appropriation of $238 million in R&D for the military tiltrotor, the V-22 Osprey, was anticipated in the fall of 1990. This funding will continue the assembly and flight testing of six prototypes. The development of a military tiltrotor is considered essential to the rapid development of a civil version, yet defense cuts threaten the future of the program. As part of the National Civil Tiltrotor Initiative, the Federal Aviation Administration is leading the effort to prepare the aviation infrastructure for a civil tiltrotor aircraft, with deliveries of a civil model possible before the end of the decade.

Another key to the future of the U.S. helicopter industry is the success of defense programs, such as the Army LH helicopter. The proposed size of this program has already been cut in half. If the Defense Department cancels it altogether, the number of U.S. turbine helicopter manufacturers may be reduced.

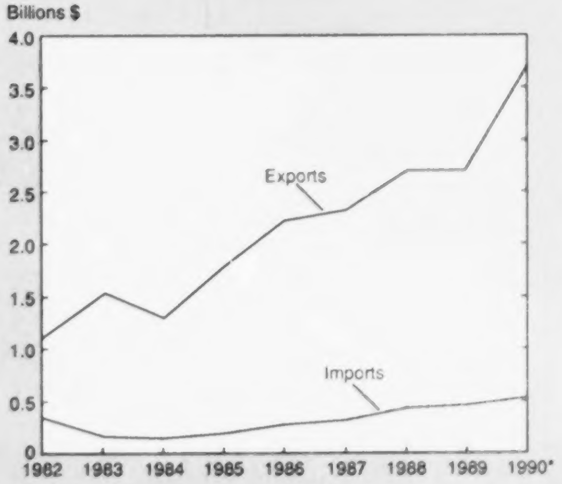
Military Aircraft Market

U.S. military aircraft manufacturers continue to encounter a worldwide decline in defense spending for aircraft but the 1990 crisis in Kuwait raised questions over just how much defense budgets should be cut.

Demand for U.S. military aircraft has been declining since 1987. From 1987 to 1990, constant-dollar shipments fell at an average annual rate of about 14 percent. In 1990, shipments of civil aircraft exceeded shipments of military aircraft for the second consecutive year since 1981. The decline in military aircraft demand is largely an outgrowth of lower defense spending.

In 1990, the U.S. Government accounted for approximately 80 percent of military aircraft purchases. The Department of Defense's Foreign Military Sales program and direct exports accounted for the remaining 20 percent. Budget deficits and a reduced Soviet threat put continued pressure on the Government to reduce defense spending. Fiscal 1990 outlays for military aircraft programs declined

Figure 22-2
U.S. Aerospace Trade with Japan



* Estimated.
Source: U.S. Department of Commerce, International Trade Administration.

10 percent in nominal dollars from the year before. Fiscal 1991 outlays are proposed to be down another 2 percent, but may be lower in the final budget. Budget cuts are expected to be even more severe in the 1992–1997 period.

The budget cuts have had an effect on all aircraft programs: fixed wing and helicopter, combat and transport, in-production and in-development. In fiscal 1990, Congress reduced the number of B–2 strategic bombers scheduled for production from three to two. It is possible that the entire B–2 program may be terminated after only 15 are made. In fiscal 1991, development programs such as the Army's LH helicopter and the Air Force's ATF fighter, on which industry has spent several hundred million dollars in development, will be funded at lower-than-planned levels. Indeed, the programs may be canceled. Production of the Air Force's C–17 transport is likely to be stretched out or delayed, and procurement of aircraft such as the F–15, F–16, and F–18 may also be trimmed back.

Proposed cuts are likely to reduce the number of military airframe manufacturers. All of the Pentagon production contracts for airplanes made by Grumman Aircraft are expiring. Without new contracts, the company will be out of the airframe business. Northrop is relying on two programs threatened with cancellation or reduction: the B-2 and the ATF. Without the LH helicopter program, the number of manufacturers of military helicopters is likely to be reduced.

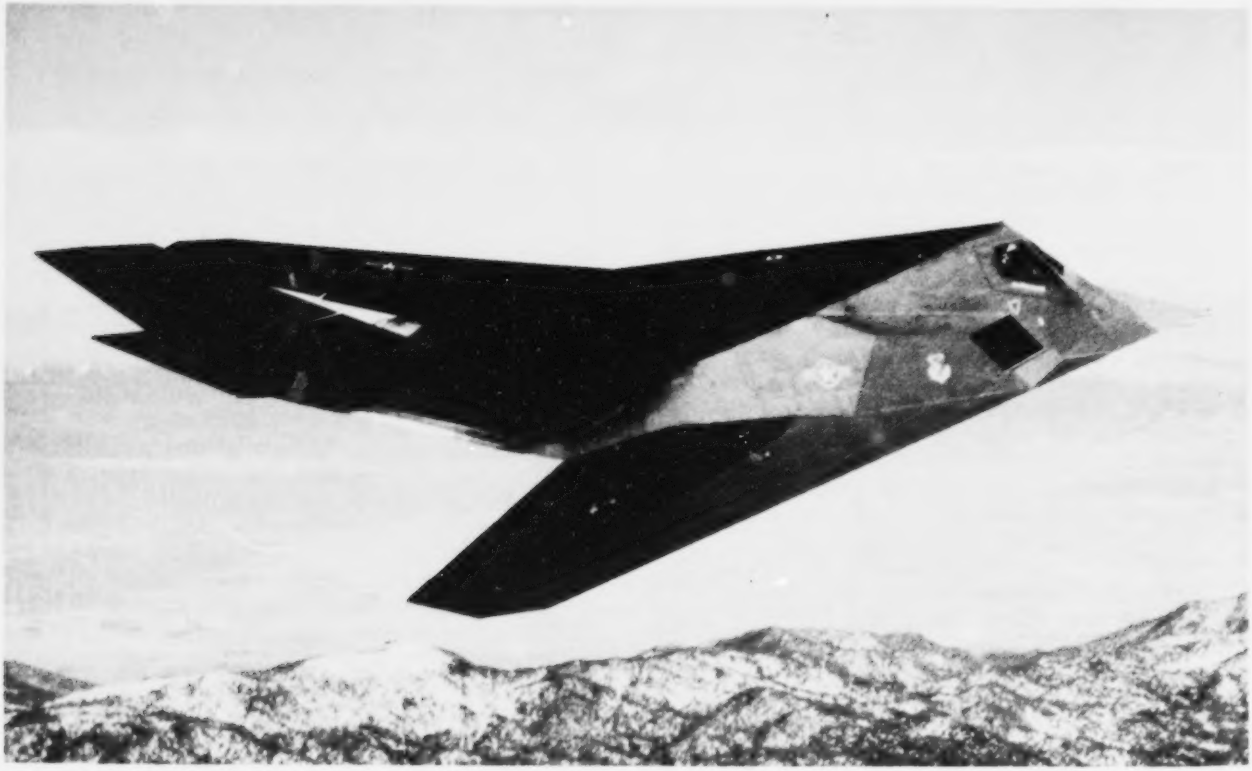
The Iraqi invasion of Kuwait was a sudden reminder of the instability of the Third World. The fiscal 1991 defense budget and the level of future defense spending reflect a recognition of that instability. Spending levels for military aircraft, especially the C–17 transport, were given a second look after the invasion.

Nonetheless, global defense spending is on the decline, especially in Europe. U.S. manufacturers are finding it more difficult to compete in the European defense market as Europe's own military aircraft industry consolidates to hold on to a larger share of declining local markets.

Exports are also affected by the growth in multinational cooperative programs, such as the FSX codevelopment program with Japan, Boeing Helicopter's CH–47 coproduction program with Kawasaki of Japan, General Dynamic's F–16 co-production program with Turkey, and the F–18 coproduction program with Korea. The growth of multinational programs mean that fewer complete aircraft and more lower-value subsystems will be exported.

U.S. manufacturers of military aircraft also face new competition overseas. Embraer of Brazil continues production of the AM-X fighter/bomber, designed in partnership with Aeritalia and Aermacchi of Italy and first delivered in 1989. AIDC of Taiwan has test flown its Indigenous Defense Fighter (IDC), developed to replace Taiwan's existing fleet of U.S.-produced fighter aircraft. India plans to build a new fighter, the Light Combat Aircraft (LCA). The Soviet Union is actively pursuing export sales of its newest technology aircraft, such as the Mig-27 and Mig-29, in order to generate badly needed foreign currency.

Recent U.S. Government actions have supported the industry's exports of military aircraft. In fiscal 1990, the Export-Import Bank, as the official U.S. export credit agency, approved guarantees for a $1.6 billion sale to Turkey for



Lockheed Advanced Development Co.

Budget deficits and the end of the cold war put pressure on the Government to reduce spending for military aircraft.

Sikorsky's UH-60L helicopter kits, and an $83-million sale of helicopters to Colombia. The Export-Import Bank decision to support limited military exports departed from the Bank's previous policy and was enabled by two statutory enactments that expired at the end of fiscal 1990. Prospects for renewal of the legislative authority and the form it would take are unclear at this writing.

The U.S. government decision to waive the restrictions on F-15 fighter aircraft sales to Saudi Arabia reopens a large potential market for U.S.-made military aircraft. Friendly Arab states, already large markets for military aircraft, are increasing their purchases following the Iraqi crisis. Exports of U.S.-made military aircraft into the region increased in 1990 and are expected to continue to increase in 1991.

AIRCRAFT EQUIPMENT, INCLUDING ENGINES

Shipments of aircraft engines (SIC 3724) and airframe parts (SIC 3728) registered a constant-dollar gain of 12 percent in 1990, rising to $41 billion from $35 billion in 1989. These shipments accounted for more than 30 percent of total aerospace shipments. Strong demand for civil aircraft engines compensated for a declining market for military aircraft engines. During 1991, demand in the civil sector should continue to compensate for the decline on the military side, and the equipment sector should experience modest growth.

Engine Sector Begins to Slow Down

The surge in demand for large transport aircraft over the past three years has led to a large number of orders for U.S. turbofan engines. The worldwide backlog of more than 7,500 orders for civil turbofan engines as of August 1990 will sustain civil engine production for several years.

On the other hand, declining production of military aircraft has had a negative effect on the market for military engines. Cuts in new military aircraft programs such as the B-2, and cuts in the planned modernization of older military aircraft such as the KC-135, have left engine manufacturers scrambling to reduce factory capacity. General Electric, the largest manufacturer of turbine engines for military aircraft, has already announced a plan to cut 1,500 jobs from its military aircraft engine business by 1992.

Sales of spare engines and replacement parts make up a large part of the aircraft engine business. This after-market will continue to grow in tandem with the world fleet of civil aircraft. According to Boeing, the inventory of western-built commercial transport aircraft has grown 5 to 6 percent per year for the last three years. The fleet is expected to continue to expand for the next several years. The market for spare military engines and replacement parts should experience some short-term growth in 1991 because of the increased utilization and maintenance requirements of the U.S. military aircraft used in Operation Desert Shield in Saudi Arabia.

In 1990, U.S. exports of civil and military aircraft engine products rose to $6.7 billion, a 1 percent increase over 1989. The export market for aircraft engines mirrors the situation on the production side, with the strength of civil engine exports compensating for a decline in exports on the military side. U.S. manufacturers are exporting more civil aircraft engines to fast-growing foreign aircraft producers. General Electric and Pratt & Whitney, or international consortia involving these U.S. companies, currently supply almost all of the engines for Airbus Industrie aircraft. Textron Lycoming supplies the engines for the British Aerospace BAe-146 airliner. U.S. engines also power a large share of foreign-produced general aviation airplanes and helicopters.

International cooperation among engine manufacturers has become a predominant feature of the engine sector. This approach has led to a maze of interlocking relationships, and to shared responsibility for a variety of production and research programs. General Electric and SNECMA of France are collaborating on what is currently the best-selling large turbofan engine on the market—the CFM56. GE also has an agreement with SNECMA, with Fiat of Italy, and with IHI of Japan to develop the GE90 large turbofan engine. The IAE consortium, maker of the new V2500 turbofan, includes Pratt & Whitney, Rolls Royce of the United Kingdom, Japanese Aero Engines, MTU of Germany, and Fiat. Pratt & Whitney and MTU cooperation on engine development is part of a new agreement by their respective parent companies, United Technologies and Daimler-Benz. IHI and KHI, also of Japan, have become partners with Rolls Royce on the Trent engine program. Separately, Rolls Royce has an agreement with BMW of Germany to cooperate on the Trent and Tay engines and also on a new regional jet engine program. The international teaming is driven by growth in the international

Trends and Forecasts: Aircraft Engines and Engine Parts (SIC 3724)

(in millions of dollars except as noted)

Item	1987	1988[1]	1989[2]	1990[2]	1991[3]	Percent Change 1987-88	Percent Change 1988-89	Percent Change 1989-90	Percent Change 1990-91
Industry Data									
Value of shipments[4]	20,262	20,864	19,281	22,199	23,753	3.0	−7.6	15.1	7.0
Value of shipments (1987$)	20,262	20,781	18,398	20,255	21,039	2.6	−11.5	10.1	3.9
Total employment (000)	140	142	139	137	135	1.4	−2.1	−1.4	−1.5
Production workers (000)	79.8	76.8	75.4	74.4	73.4	−3.8	−1.8	−1.3	−1.3
Average hourly earnings ($)	14.23	14.02	14.62	15.35	—	−1.5	4.3	5.0	—
Capital expenditures	747	693	—	—	—	−7.2	—	—	—
Product Data									
Value of shipments[5]	18,822	19,857	18,632	20,867	19,615	5.5	−6.2	12.0	−6.0
Value of shipments (1987$)	18,822	19,758	17,762	19,022	17,358	5.0	−10.1	7.1	−8.7

[1] Advance data from the 1988 Annual Survey of Manufactures.

[2] Estimate.

[3] Forecast.

[4] Value of all products and services sold by establishments in the aircraft engines and engine parts industry.

[5] Value of products classified in the aircraft engines and engine parts industry produced by all industries.

SOURCE: U.S. Department of Commerce: Bureau of the Census, International Trade Administration (ITA). Estimates and forecasts by ITA.

Trends and Forecasts: Aircraft Parts and Equipment, NEC (SIC 3728)

(in millions of dollars except as noted)

Item	1987	1988[1]	1989[2]	1990[2]	1991[3]	Percent Change 1987-88	1988-89	1989-90	1990-91
Industry Data									
Value of shipments[4]	17,923	18,048	15,882	19,059	20,012	0.7	−12.0	20.0	5.0
Value of shipments (1987$)	17,923	18,683	15,740	18,065	18,410	4.2	−15.8	14.8	1.9
Total employment (000)	188	186	188	186	184	−1.1	1.1	−1.1	−1.1
Production workers (000)	104	101	101	100	99.2	−2.9	0.0	−1.0	−0.8
Average hourly earnings ($)	13.81	13.77	14.20	14.92	—	−0.3	3.1	5.1	—
Capital expenditures	737	653	—	—	—	−11.4	—	—	—
Product Data									
Value of shipments[5]	19,513	21,070	17,947	21,537	22,164	8.0	−14.8	20.0	2.9
Value of shipments (1987$)	19,513	21,789	16,168	20,395	20,371	11.7	−25.8	26.1	−0.1

[1] Advance data from the 1988 Annual Survey of Manufactures.

[2] Estimate.

[3] Forecast.

[4] Value of all products and services sold by establishments in the aircraft parts and equipment, nec industry.

[5] Value of products classified in the aircraft parts and equipment, nec industry produced by all industries.

SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA). Estimates and forecasts by ITA.

civil market, decline in the military market, and high development costs and risks associated with large turbofan engine development.

Aircraft Parts Industry

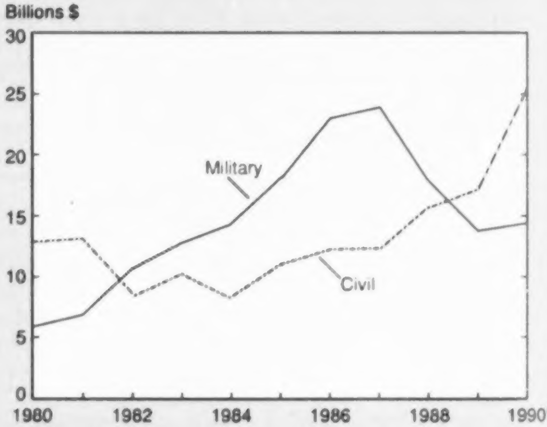
Most of the same factors driving demand in the complete aircraft and aircraft engine sectors affect the aircraft equipment industry. Shipments of aircraft parts climbed at a real rate of almost 15 percent in 1990. Increasing demand for U.S. and foreign transport aircraft is the principal driver behind current growth in demand for aircraft parts. The after-market is expanding to support a larger and older fleet of civil aircraft. Yet the decline in demand for military aircraft will serve to moderate growth in this sector.

U.S. airframe parts manufacturers are encountering increased competition from foreign producers seeking a larger share of the world market. Many foreign customers for aircraft are making aircraft purchases contingent on offset concessions from the original equipment manufacturers. This practice is most pronounced in the military sector, where foreign governments seek to assist domestic industries by gaining production subcontracts or technology in exchange for making military aircraft purchases.

In 1990, imports of airframe parts grew to an estimated $3.1 billion, a 5 percent increase from the level recorded in 1989. Canada is currently the largest foreign source of airframe parts for United States aircraft programs. Other major suppliers include France, Japan, Italy, and the United Kingdom.—*Hugh Walsh, Office of Aerospace Policy and Analysis, (202) 377-0677, September 1990.*

Figure 22-3

U.S. Civil and Military Aircraft Shipments, 1980-1990



* Estimate.

Source: U.S. Department of Commerce, International Trade Administration; General Aviation Manufacturers Association; Aerospace Industries Association.

MISSILES AND SPACE VEHICLES

Shipments of U.S. missile systems and space launch vehicles in 1990 increased at a real rate of 2 percent. The relative size of the missile and space sectors increased through the past decade, growing from 18 percent of total aerospace industry shipments in 1980 to 26 percent in 1990.

The year was mixed for the space industry, with technical disappointments offset by significant revenues from successful launches. In March, a commercial Titan failed to separate from its Intelsat payload, marking the first failure of a major U.S. commercial launch. The satellite was left stranded in a transitional low-Earth orbit. For the first time, each of the three major U.S. launch providers—General Dynamics, Martin Marietta, and McDonnell Douglas—launched commercial payloads, with expected revenues of $570 million from nine medium- to large-capacity launches. April 1990 also saw the entry of a new breed of launch vehicle with the launch of the winged, air-launched Pegasus.

Increased demand for space launch services prompted manufacturers to increase production of expendable launch vehicles (ELVs). The loss of the space shuttle Challenger in 1986 and the subsequent decision to remove commercial payloads from the shuttle manifest are largely responsible for the upturn in demand for commercial launch services. Worldwide commercial demand currently ranges from 15 to 20 launches of medium and large payloads per year, with a growing number of small and suborbital payloads.

Trends and Forecasts: Guided Missiles and Space Vehicles (SIC 3761)

(in millions of dollars except as noted)

Item	1987	1988[1]	1989[2]	1990[2]	1991[3]	Percent Change 1987-88	Percent Change 1988-89	Percent Change 1989-90	Percent Change 1990-91
Industry Data									
Value of shipments[4]	21,566	23,558	24,783	25,744	26,548	9.2	5.2	3.9	3.1
Value of shipments (1987$)	21,566	24,746	26,170	26,650	26,952	14.7	5.8	1.8	1.1
Total employment (000)	167	178	176	176	176	6.6	−1.1	0.0	0.0
Production workers (000)	62.7	59.1	57.8	57.6	57.6	−5.7	−2.2	−0.3	0.0
Average hourly earnings ($)	16.64	15.77	16.51	17.50	—	−5.2	4.7	6.0	—
Capital expenditures	819	771	—	—	—	−5.9	—	—	—
Product Data									
Value of shipments[5]	16,012	17,348	18,250	19,949	19,646	8.3	5.2	9.3	−1.5
Value of shipments (1987$)	16,012	18,319	19,374	20,759	20,047	14.4	5.8	7.1	−3.4

[1] Advance data from the 1988 Annual Survey of Manufactures.

[2] Estimate.

[3] Forecast.

[4] Value of all products and services sold by establishments in the guided missiles and space vehicles industry.

[5] Value of products classified in the guided missiles and space vehicles industry produced by all industries.

SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA). Estimates and forecasts by ITA.

In addition to non-military users of launch services, the Department of Defense relies heavily on ELVs for access to space. Total military demand is about 15 launches of medium and large payloads per year, with one or two launches procured commercially, and three to four launches of small ELVs. The increase in ELV production offset the decline in the assembly of shuttle orbiters and associated support parts.

During 1990, a new market began to emerge for space launch services: small satellites, or "lightsats," weighing anywhere from 50 to 900 pounds. Recent announcements of planned global cellular communications networks that will rely on a constellation of lightsats, as well as efforts by both civilian and military agencies to develop a low-cost alternative to conventional satellites, have fueled speculation that demand for small-capacity launch systems will grow and that small launch vehicles may become competitive in the future.

Although the current market for small launch vehicles is driven by military contracts, a viable small-capacity launch system is expected to have commercial applications. Given the high cost of satellites and related launch services, the development of lightsats is likely to bring with it a demand for low-cost small ELVs as space activities become possible for less affluent customers. The market for small ELVs may be further expanded by the demonstrated preference of satellite owners for dedicated launches over those shared with other payloads. The Orbital Sciences/Hercules Pegasus is well placed to capture a share of this potential market because of its high mobility and low price tag.

In 1990, four launches of small and suborbital launch vehicles (three military and one commercial) were conducted, generating revenues of approximately $27 million. In 1991, 14 launches of small launch vehicles are expected, of which 11 are commercial. These launches are expected to generate revenues of $55 million.

U.S. launch vehicle manufacturers continued to face strong foreign competition, despite the failure in February 1990 of an Ariane 4 launch and the subsequent five-month hiatus in Ariane launch services. The France-based 11-nation Arianespace consortium has maintained its share of more than half of the commercial satellite launch market, and it plans to launch seven to eight vehicles per year with as many as 12 individual payloads. Current U.S. commercial launch capacity stands at 10 or more launches per year, although not all of this capacity may be sold in any given year. The U.S. commercial launch manifest lists eight launches of medium to large payloads for 1991. Total international launch capacity continues to exceed demand.

In 1990 the People's Republic of China (PRC) used its Long March III booster for its first commercial launch. Under a 1989 Memorandum of Agreement between the PRC and the United States, the PRC can launch up nine satellites over six years at prices on a par with those prevailing on the international market for comparable launch services. The PRC currently has commitments to launch three other commercial satellites.

Trends and Forecasts: Space Propulsion Units and Parts (SIC 3764)

(in millions of dollars except as noted)

Item	1987	1988[1]	1989[2]	1990[2]	1991[3]	Percent Change 1987-88	Percent Change 1988-89	Percent Change 1989-90	Percent Change 1990-91
Industry Data									
Value of shipments[4]	3,537	3,988	4,191	4,366	4,492	12.8	5.1	4.2	2.9
Value of shipments (1987$)	3,537	4,198	4,449	4,529	4,574	18.7	6.0	1.8	1.0
Total employment (000)	31.8	36.5	36.3	36.2	36.3	14.8	−0.5	−0.3	0.3
Production workers (000)	11.2	13.4	13.3	13.3	13.3	19.6	−0.7	0.0	0.0
Average hourly earnings ($)	15.77	17.25	17.98	18.78	—	9.4	4.2	4.4	—
Capital expenditures	194	223	—	—	—	14.9	—	—	—
Product Data									
Value of shipments[5]	3,465	4,313	4,320	4,479	4,627	24.5	0.2	3.7	3.3
Value of shipments (1987$)	3,465	4,564	4,601	4,670	4,736	31.7	0.8	1.5	1.4

[1] Advance data from the 1988 Annual Survey of Manufactures.

[2] Estimate.

[3] Forecast.

[4] Value of all products and services sold by establishments in the space propulsion units and parts industry.

[5] Value of products classified in the space propulsion units and parts industry produced by all industries.

SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA). Estimates and forecasts by ITA.

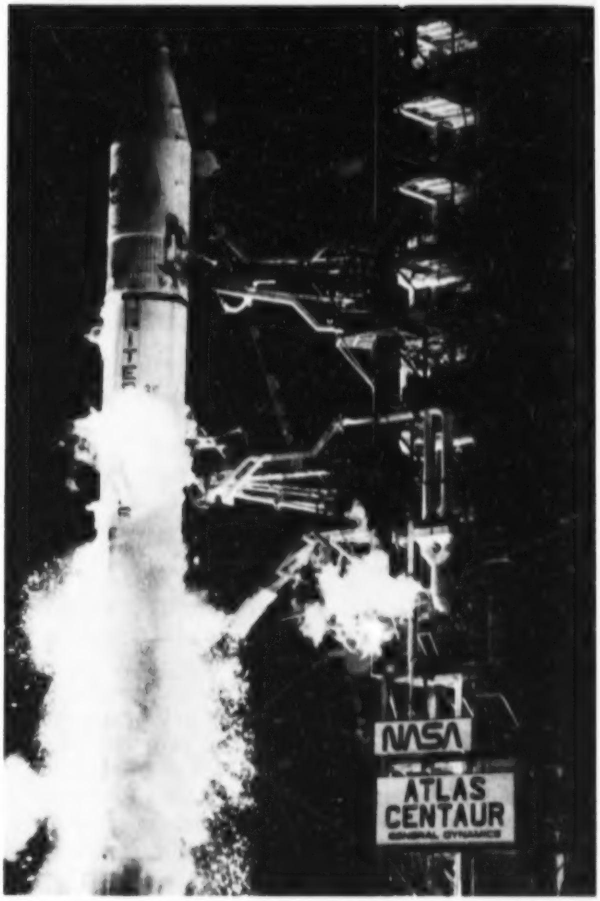
Despite problems with its propulsion system, progress continues on the development of Japan's first completely indigenously designed and produced ELV, the H-II, slated for launch in 1993. The H-II program got a boost in July 1990 when 77 Japanese companies formed a consortium to manufacture the H-II. Japan currently meets its domestic demand with the H-I, which is partially based on U.S. technology.

The commercial space port planned for Australia's Cape York peninsula, proposed to become operational in 1995, as well as the aggressive marketing efforts by the Soviet Union of its Zenit rocket, if sucessful, will bring additional capacity to the already shallow market for commercial launch services. Finally, space programs in Brazil, India, and Israel may emerge as potential long-term competitors to the U.S. commerial launch industry. (For additional information, see chapter 42, Space Commerce.)

In a reversal of the growth trends of the 1980s, 1990 was a year of declining growth for the manufacturers U.S. missile systems. Department of Commerce figures show that the value of missile systems shipped to the U.S. government between 1980 and 1989 increased at a compound annual rate of more than 14 percent. Total Department of Defense outlays for missile procurement during this 10-year period amounted to $94.5 billion, while exports passed the $1-billion mark in 1989. U.S. budget constraints will reduce procurement outlays for missiles to $13.8 million in 1990—down from $14.5 million in 1989. Approximately $1.3 billion in missile systems is expected to be exported.

A number of missile systems experienced difficulties in 1990, including both of the major systems stemming from the 1980 missile development Memorandum of Understanding between the United States, West Germany and the United Kingdom. The U.S. Advanced Medium Range Air-to-Air Missile (AMRAAM) experienced a five-month delivery embargo because of reliability problems, funding cuts, and termination recommendations in the fiscal 1991 budget, while the European Advanced Short Range Air-to-Air Missile (ASRAAM) program remained stalled after West Germany withdrew from the project in 1988. There appears to be little likelihood that this program will be revived.

In addition, a number of tactical and strategic missile programs have been scaled back or terminated, including the Hawk, Phoenix, Maverick, Sidewinder, and Tomahawk programs. The Iraqi invasion may lead some programs to be reinstated at higher procurement levels, but the crisis is unlikely to have much impact on long-term program development or termination plans.



General Dynamics

Demand for launched commercial payloads is growing even as the number of military applications of missiles is scaled back.

Outlook for 1991

U.S. shipments for missiles, space vehicles, and related products (SIC 376) are forecast to grow more than 3.0

Trends and Forecasts: Space Vehicle Equipment, NEC (SIC 3769)

(in millions of dollars except as noted)

Item	1987	1988[1]	1989[2]	1990[2]	1991[3]	Percent Change 1987-88	1988-89	1989-90	1990-91
Industry Data									
Value of shipments[4]	1,182	1,066	1,121	1,166	1,201	−9.8	5.2	4.0	3.0
Value of shipments (1987$)	1,182	1,120	1,184	1,207	1,219	−5.2	5.7	1.9	1.0
Total employment (000)	15.1	10.8	10.7	10.7	10.7	−28.5	−0.9	0.0	0.0
Production workers (000)	7.9	6.6	6.6	6.6	6.6	−16.5	0.0	0.0	0.0
Average hourly earnings ($)	15.24	14.64	15.30	15.90	—	−3.9	4.5	3.9	—
Capital expenditures	62.3	24.8	—	—	—	−60.2	—	—	—
Product Data									
Value of shipments[5]	3,354	3,555	3,461	3,600	3,708	6.0	−2.6	4.0	3.0
Value of shipments (1987$)	3,354	3,754	3,674	3,746	3,784	11.9	−2.1	2.0	1.0

[1] Advance data from the 1988 Annual Survey of Manufactures.

[2] Estimate.

[3] Forecast.

[4] Value of all products and services sold by establishments in the space vehicle equipment, nec industry.

[5] Value of products classified in the space vehicle equipment, nec industry produced by all industries.

SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA). Estimates and forecasts by ITA.

percent. A concurrent increase in employment of 0.4 percent will boost the combined workforce to 230,000. Increasing production of U.S. launch vehicles will pace the expansion. Funding to complete construction of the space shuttle Endeavor—scheduled for delivery in April—is expected to total $1.8 billion, $300 million under the 1987 estimate of $2.1 billion. Department of Defense outlays for missile procurements are expected to increase slightly, to about $14.5 billion, while exports continued at $1 billion per year.

Long-Term Prospects

The coming decade should bring new developments and technologies to the space launch industry. First, the joint DOD/NASA Advanced Launch System (ALS) program is expected to provide significant cost-saving technology. That, in turn, should help bring down the cost of launch services for and improve the competitiveness of U.S. launch companies. While ALS has been scaled back from the development of a new heavy-lift vehicle to a more efficient propulsion system, its spin-offs will benefit both existing and new launch systems. NASA has shown interest in ALS as a stepping stone to the heavy-lift vehicle needed for the Space Exploration Initiative and other programs.

Preliminary work continues on the development of the X-30 National Aerospace Plane (NASP) by NASA and the Defense Department. The NASP, a single-stage-to-orbit vehicle capable of speeds of 17,000 miles per hour, could bring a wealth of technological spin-offs to the launch industry. Scheduled to fly before the turn of the century, the NASP could revolutionize space transportation and further enhance the competitiveness of the U.S. launch industry. The estimated cost of building and flying two NASP prototypes is more than $5 billion, not including development funding. More than $1 billion in funds had been appropriated through fiscal 1990. Funding for NASP in fiscal 1991 is expected to be lower than in previous years.

Overall demand for commercial launch services is expected to fall off from the current level of about 20 launches of medium to large satellites to about 10 to 12 launches per year after 1994. The U.S. military is expected to maintain its current demand of approximately 15 medium and large payload launches per year for the remainder of the decade, including several commercial procurements each year. The demand for small-capacity launch vehicle and services is still largely speculative, but has been projected by some at more than 20 launches per year by the mid-1990s.

A large share of U.S. output of missiles and space vehicles is for the defense market, but declining aerospace defense budgets have not interrupted growth over the past decade. However, the diminishing Soviet threat, coupled with uncertainty in Strategic Arms Reduction Talks (START) agreement verification rules, and reduced funding for the Strategic Defense Initiative (SDI) and the B-2 bomber program are likely to produce a wait-and-see posture toward strategic missile programs planned for the coming decade. The long-term outlook for tactical missiles is more certain given the number of programs already underway. Annual foreign government demand for tactical missiles is forecasted at $1 billion-plus for the next decade.—*Pete Pajor, Office of Aerospace Policy and Analysis, (202) 377-8228, September 1990.*

Additional References

(Call the Bureau of the Census at (301) 763-4100 for information about how to order Census documents.)

New Complete Aircraft and Aircraft Engines (Except Military), Current Industrial Report, M37G series, Bureau of the Census, U.S. Department of Commerce, Washington, D.C. 20233. Telephone: (301) 763-5573.

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Aerospace Facts and Figures, 1989-1990, Aerospace Industries Association of America, 1988, 1250 Eye Street, N.W., Washington, D.C. 20005. Telephone: (202) 371-8563.

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23

Shipbuilding and Repair

The U.S. Shipbuilding and Ship Repair Industry is at a crossroad. The outlook for 1991 and beyond is not clear but will depend on how well U.S. shipyards adapt to international and domestic events. The Navy will continue to provide the bulk of new construction and repair work during the next four years but there are indications that this work will diminish as the size of the naval fleet declines. Mandatory double hulls on tankers in U.S. waters could contribute to a revival of commercial shipbuilding orders for U.S. shipyards. In addition, there are signs that U.S. shipyards will have an opportunity to capture a share of the world shipbuilding market which is forecast to expand.

Before reading this chapter, please see "How to Get the Most Out of This Book" on page 1. It will clarify questions you may have concerning data collection procedures, factors affecting trade data, forecasting methodology, the use of constant dollars, the difference between industry and product data, sources and references, and the Standard Industrial Classification system (SIC). For other topics related to the subject of this chapter, see chapters 15 (Metals) and 41 (Transportation Services).

The world shipbuilding industry has recently experienced a surge in the orderbook of merchant ships on order or under construction. As of mid-1990, the world orderbook for merchant ships, 100 gross tons (gt) and over, was comprised of 2,665 ships totaling 39.9 million gt. This orderbook reflected a 13 percent increase from 2,355 ships on order a year earlier and a 46 percent increase from the 27.3 million gt of ships on order. The average size merchant ship on order increased 28 percent, from 11,600 gt to 14,900 gt. The world shipbuilding industry's thirteen-year recession, the longest of the post-World War II era, seems to have ended in early 1987, when the orderbook reached a low of 20.6 million gt.

Japan led the world in merchant shipbuilding in mid-1990, commanding 33.0 percent of the gross tonnage of merchant ships on order, followed by South Korea with 24.5 percent. Yugoslavia occupied a distant third place with 4.4 percent. The United States was 28th, with only one-fifth of 1 percent of the gross tonnage on order. U.S. shipyards (SIC 3731) remained unable to compete because foreign shipbuilders continue to offer merchant vessels at lower prices. To survive, U.S. builders must rely almost exclusively on military and domestic ship procurement reserved under Federal law.

The U.S. Active Shipbuilding Base (ASB) is defined as privately owned shipyards that are open, engaged in, or actively seeking, construction contracts for naval and commercial ships over 1,000 gross tons. These full-service yards are the primary sector of the first-tier shipyards, which are facilities capable of constructing, drydocking, or topside repairing vessels 400 feet in length and over. As of October 1, 1990, there were 16 ASB shipyards. This is one less than reported in 1989 due to the closing of the Todd Shipyards at Galveston, Texas. The ASB shipyards continue to employ about three-quarters of the shipbuilding and ship repair industry's total work force of about 124,000. The remaining one-quarter is distributed over the 500 establishments classified under SIC 3731 (Shipbuilding and Repairing). In addition, but not included in SIC 3731, are nine Government-owned shipyards. These yards do not engage in new construction, but rather in the overhaul and repair of Navy and Coast Guard ships.

The Maritime Administration (MARAD) provides indirect assistance to U.S. shipyards through the mortgage

Trends and Forecasts: Shipbuilding and Repair (SIC 3731)

(in millions of dollars except as noted)

Item	1987	1988[1]	1989[2]	1990[2]	1991[3]	Percent Change 1987-88	1988-89	1989-90	1990-91
Industry Data									
Value of shipments[4]	8,504	8,793	9,278	9,823	10,251	3.4	5.5	5.9	4.4
Value of shipments (1987$)	8,504	8,610	8,696	8,802	8,838	1.2	1.0	1.2	0.4
Total employment (000)	120.2	120.1	122.5	124.0	124.5	0.0	2.0	1.2	0.4
Production workers (000)	90.5	89.5	90.8	91.5	92.0	−1.1	1.5	0.8	0.5
Average hourly earnings ($)	12.16	12.30	12.45	12.59	—	1.2	1.2	1.1	—
Capital expenditures	273	238	—	—	—	−12.8	—	—	—
Product Data									
Value of shipments[5]	8,343	8,630	8,986	9,505	9,928	3.4	4.1	5.8	4.5
Value of shipments (1987$)	8,343	8,458	8,414	8,517	8,551	1.4	−0.5	1.2	0.4

[1] Advance data from the 1988 Annual Survey of Manufactures.

[2] Esimate.

[3] Forecast.

[4] Value of all products and services sold by establishments in the ship building and repairing industry.

[5] Value of products classified in the ship building and repairing industry produced by all industries.

SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA). Estimates and forecasts by ITA.

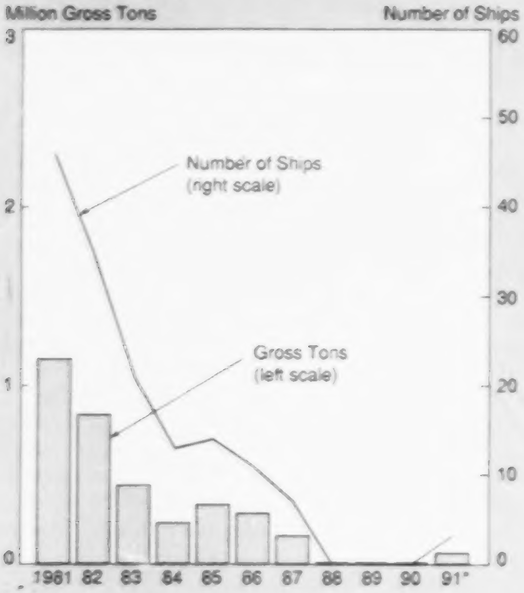


Figure 23-1

Merchant Vessels: Building or on Order

Note: Data for ships of 1,000 gross tons or larger as of January 1 of each year.
*Forecast.
Source: U.S. Department of Transportation, Maritime Administration.

guarantee (Title XI) and capital construction fund programs. The U.S. Government grants guarantees to private-sector lending organizations for the repayment of interest and mortgage-loan obligations of a shipowner in the purchase of ships from U.S. shipyards. MARAD permits a qualified U.S. operator to establish a capital construction fund. The operator utilizes the deferred tax dollars by drawing equity from the fund for investments in new or reconstructed vessels purchased from U.S. shipyards.

Most importantly, the Federal Government provides significant direct support to the industry with the purchase and repair of ships and the procurement of goods and services from a large number of shipyards and related industries. Principal contracting Government agencies include the Naval Sea Systems Command, Military Sealift Command, Army Corps of Engineers, U.S. Coast Guard, National Oceanic and Atmospheric Administration, National Science Foundation, and the Maritime Administration.

The total value of work completed by U.S. shipyards in 1990 was $8.8 billion, up 1.2 percent from 1989 in constant dollars. The depressed state of the U.S. commercial shipbuilding industry has caused many shipyards to close or enter bankruptcy during the past few years. However, the largest combatant ship construction program (nearly $100 billion appropriated) in the U.S. Navy's peacetime history was undertaken during the 1980s. This program will continue into the 1990's, but at a diminished level.

Military Ship Construction

In 1990, the Navy's ship construction projects contir to dominate the workload in U.S. shipyards. During first three quarters of the year, six Navy vessels of 1, light displacement tons (ldt) and over, were ordered f U.S. private shipyards while 11 Navy vessels and one U Coast Guard medium endurance cutter were delivered. of October 1, 1990, the Navy had 90 ships on order under construction, 1,000 ldt and over. There are curre no Coast Guard medium endurance cutters on order under construction. These 90 Navy ships—24 of wh have deliveries extending to 1994 or later—are being c structed in 11 U.S. privately owned shipyards (see Table

Table 1: Number of Military Ships under Construction, by Type, October 1, 1990

Symbol	Type	Num
AOE	Fast Combat Support Ship	
AGOR	Oceanographic Research Ship	
CG	Guided Missile Cruiser	1
CVN	Aircraft Carrier (Nuclear-Powered)	
DDG	Guided Missile Destroyer	1
LHD	Amphibious Assault Ship (Multi-Purpose)	
LSD	Dock Landing Ship	
MCM	Mine Countermeasures Ships	
SSN-21	Attack Submarine (Nuclear-Powered)	
SSN-688	Attack Submarine (Nuclear-Powered)	1
SSBN	Ballistic Missile Submarine (Nuclear-Powered)	
T-AGOS	Ocean Surveillance Ship (SWATH)	
T-AGS	Ocean Survey Ship	
T-AGS	Coastal Hydrographic Ship	
T-AO	Oiler	1
	Total military ships	9

SOURCE: U.S. Department of the Navy.

Many U.S. shipyards do not have the experience a expertise required to construct sophisticated naval comb ants. The Navy's T-ship projects, however, are providing so work for five shipyards that traditionally have relied commercial ship construction. The prefix "T" designa civilian manned Navy auxiliary ships under control of t Military Sealift Command. In addition to the 18 T-ships order or under construction as of October 1, 1990, (which included in Table 1), one T-ship is currently undergoing ma reconstruction.

Contracts for construction, conversion, and repair of Na and Coast Guard ships accounted for about 92 percent of t production work force within the ASB in 1990. The perce age of employment supported by Navy work is forecast drop slightly in 1991.

Commercial Ship Construction

The U.S. commercial ship construction market, whi had declined steadily for 15 years, has experienced a slig upturn in orders (Figure 23-1). In January 1990, Nation Steel and Shipbuilding Company (NASSCO) of San Die received the first oceangoing commercial ship order plac in a U.S. shipyard since October 1984. This order, placed Matson Navigation Company, is for a 713-foot dies powered containership of 32,600 gross tons (gt) and c signed to carry 1,650 24-foot containers.

In October 1990, Eastern Shipyards, Inc. of Panar City, Florida, signed a contract with Freeport-McMor Resource Partners to build two sulphur carriers. Ea 398-foot ship will carry 7,500 tons of liquid sulfur fro

U.S. Trade Patterns in 1989
Shipbuilding and Repair
SIC 3731
(in millions of dollars, percent)

Exports	Value	Share	Imports	Value	Share
Canada & Mexico	8.3	2.6	Canada & Mexico	10.2	6.8
South America	31.6	10.1	South America	0.0	0.0
European Community	40.1	12.8	European Community	5.5	3.7
East Asia NICs	77.8	24.9	East Asia NICs	113.0	75.8
Japan	5.1	1.6	Japan	0.1	0.1
Other	150.0	48.0	Other	20.3	13.6
World Total	312.9	100.0	World Total	149.1	100.0
Top Five Countries					
	Value	Share		Value	Share
South Korea	37.8	12.1	South Korea	65.0	43.6
Australia	34.6	11.1	Singapore	48.1	32.2
Singapore	30.3	9.7	Sweden	17.4	11.7
Bermuda	20.4	6.5	Canada	9.6	6.4
Turkey	20.2	6.5	United Kingdom	4.1	2.7

See "How to Get the Most Out of This Book" for definitions of the Country Groupings.
SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA).

Freeport-McMoran's mining complex in the Gulf of Mexico to Port Sulphur, Louisiana, on the Mississippi River. The first ship is expected to be delivered in late 1991 and the second ship in early 1992.

Another U.S. shipyard, Trinity Halter Marine of Gulfport, Mississippi, has been involved in an international competition for a contract to build one or two 8,000 gt ferries for the British Columbia Ferry Corporation of Canada. Each ferry will have a capacity for 2,100 passengers, as well as 470 automobiles. The U.S. shipyard was apparently the low bidder; however, the contract was awarded to a Canadian shipyard on the basis that international trading agreements do not apply to provincial or local procurement.

Passenger and Cruise Vessel Construction

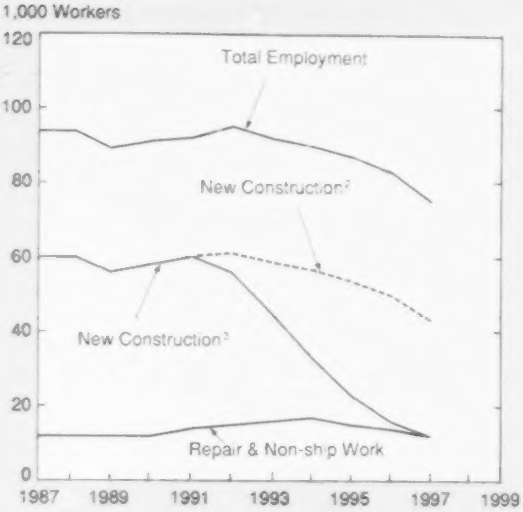
A U.S. shipyard won a contract in competition with European and Asian shipbuilding companies to convert and overhaul the 26,750 gt, 1,535-passenger cruise ship, the *Viking Serenade*, originally built in 1982. The owner of the vessel, Royal Caribbean Cruise Line, placed the contract with Southwest Marine, Inc., of San Diego. The contract calls for the addition of 260 cabins, a new lounge, a new dining room for 302 guests, the addition of a new heating and air conditioning system, as well as the overhaul of the fire protection and communications systems. After the conversion, the *Viking Serenade* will be able to accommodate 1,953 passengers.

U.S. Exports and Imports
Shipbuilding and Repair
(in millions of dollars except as noted)

SIC	Industry	1989	1990[1]	1991[2]	Percent Change 1989–90	Percent Change 1990–91
3731	Ship building and repairing					
	Value of exports	313	337	359	7.6	6.5
	Value of imports	149	165	180	10.7	9.1

[1] Estimate
[2] Forecast
SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA). Estimates and forecasts by ITA.

Figure 23-2
Active Shipbuilding Base Labor Projection on October 1, 1990 for 16 Yards[1]



[1] Total employment reflects actual number of workers employed; other data refers to number of shipyard production workers expressed in 8-hour equivalent work units.
[2] Projected.
[3] Contracted.
Source: U.S. Department of Transportation, Maritime Administration.

The conversion and overhaul of the *Viking Serenade* represents the first major export work done in a U.S. shipyard in almost three decades. This contract also represents the largest cruise ship conversion undertaken in the United States.

Ship Repair

Overall, there has been little change in the status of the U.S. ship repair industry during 1990. Ship repair capacity in the United States is substantially underutilized, creating an environment of intense competition. Although there has been an increase in the repair of foreign flag civilian cruise ships by U.S. shipyards for several years, without the Navy's ship

Table 2: U.S. Navy Repair and Modernization Budgets of Active and Reserve Ships, Fiscal Years 1988–91
(in millions of dollars)

Item	1988[1]	1989[2]	1990[2]	1991[2]
Public Yards	2516.6	2399.2	2655.4	1967.2
Private Yards	1179.6	1427.2	1383.0	1462.3
Public/Private Competition	178.5	461.3	609.9	517.0
TOTAL	3874.7	4287.7	4648.3	3946.5

[1] Taken from January 1989 Congressional Budget.
[2] Taken from January 1990 Congressional Budget.
Note: Does not include other program costs.
SOURCE: U.S. Department of the Navy.

Table 3: U.S. Navy Shipbuilding and Repair Budgets, Fiscal years 1988–91

(in millions of dollars)

Item	1988[1]	1989[1]	1990[1]	1991[2]
Navy shipbuilding & conversion	16,155.4	9,055.5	11,557.9	11,195.2
Navy repair and modernization	3,874.7	4,287.7	4,648.3	3,946.5
TOTAL	20,030.1	13,343.2	16,206.2	15,141.7

[1] Appropriated.

[2] Requested.

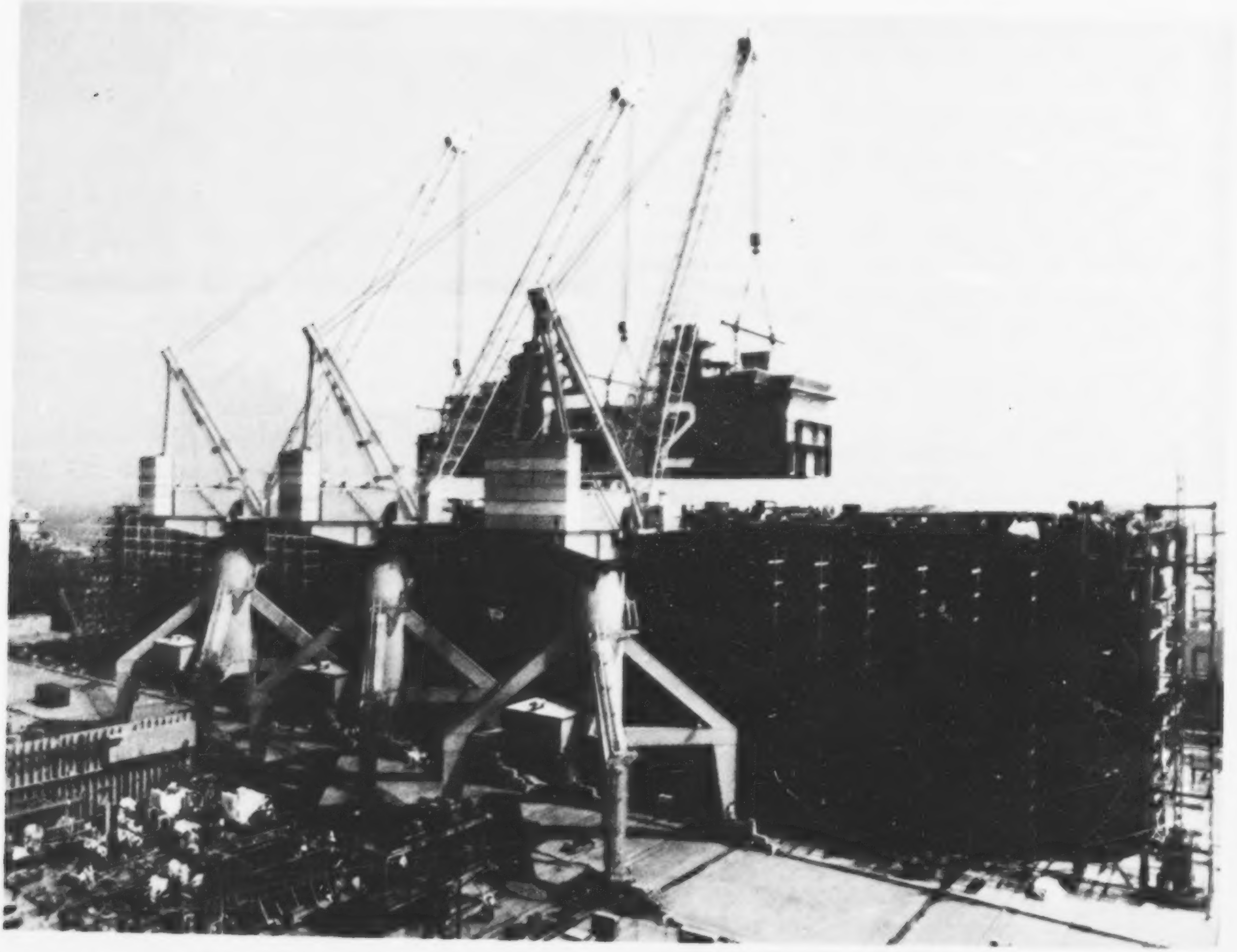
SOURCE: U.S. Department of the Navy; Shipbuilders Council of America.

maintenance and modernization program many of the Nation's ship repairers would be out of business.

The President's FY 1991 budget request for Navy ship repair and modernization for active and reserve ships is $3.9 billion, a decrease of 15 percent from the FY 1990 appropriation, as shown in Tables 2 and 3. In FY 1989, funds allocated to the private shipyards rose almost 21 percent to $1.43 billion and represented one-third of the appropriation. In FY 1990, funds allocated to the private sector declined by $44.2 million, or 3 percent, while the Navy's total appropriation for repair and modernization increased by $360.6 million. The FY 1991 budget request contains $1.46 billion for the private sector, $79.3 million, or 5.7 percent higher than was actually appropriated the previous year. The FY 1991 funding for the private sector shipyards for ship repair and modernization accounts for 37 percent of the total Navy budget request.

Before 1985, Navy repair work was either allocated to public yards or awarded to private yards. The majority of ship repair work is still distributed on an allocation basis. In FY 1985, the Navy launched a ship repair competition test program between public and private shipyards. With competitive bidding, however, most submarine repairs have gone to the public shipyards, while the private sector has won the bulk of the contracts for surface ship repairs. Between FY 1988 and 1990, funds for public and private competition rose from $178.5 million to $609.9 million, an increase of over 240 percent. The FY 1991 budget request for competition is $517 million.

The Maritime Administration's National Defense Reserve Fleet (NDRF) provides a steady source of ship repair work. The NDRF consists of approximately 330 ships that could be activated to meet the shipping requirements of the United States in the event of a national emergency.



Ingalls Shipbuilding

Navy ship construction projects continue to dominate the work in U.S. shipyards, and there are signs the yards will capture a greater share of the world shipbuilding market.

A key element of the NDRF is the Ready Reserve Force (RRF). By January 1991, 98 ships were to be in the RRF. The Maritime Administration provides funds for the procurement and maintenance of this force, which is maintained in a 5-day or 10-day state of readiness.

All repair and layup work on vessels purchased for the RRF program must be done at U.S. facilities. Pending approval of budget requests for FY 1991 through FY 1993, MARAD estimates that an average of $1 million a vessel per year will be expended to maintain the RRF, thus providing additional work for the domestic ship repair industry.

The RRF program is projected to contain up to 142 ships by FY 1995, which means that an average of 10 ships will be added to the fleet each year. Approximately $40 million of additional maintenance work per year will be necessary. These ships, plus the current RRF, should increase the repair workload for U.S. private shipyards in the 1990's.

Over forty RRF ships have been activated to support U.S. military operations in the Persian Gulf for Operation Desert Shield. The activation of these ships has generated approximately $60 million in work for about 25 U.S. shipyards on three coasts. (Operation Desert Shield is the military operation under the auspices of the United Nations to protect the integrity of Saudi Arabia after the invasion of Kuwait by Iraq in August 1990.)

As of October 1, 1990, it was not known if, or how many, additional vessels would be called up, nor was it known how long they would be required to feed the logistics pipeline. When these activated reserve ships return to the United States, approximately $1 million per ship will be expended in U.S. shipyards for voyage repairs and lay-up.

Second-Tier Shipyards

Another very important sector of the shipbuilding and ship repair industry is the small-size and medium-size facilities, or "second-tier shipyards." These shipyards are primarily engaged in supporting the inland and coastal carriers. Their market is the construction and repair of smaller type vessels, such as tug boats, supply boats, ferries, fishing vessels, barges and small military and government owned vessels.

In the late 1970's and the early 1980's, expectations of increased demand for vessels that would carry grain and coal to export markets led to a construction boom in the second-tier shipyards. When expected demand failed to emerge, a surplus capacity situation developed which depressed freight rates, and caused a severe contraction in the second-tier shipyards.

The second-tier shipyards experienced a decline in vessel construction activity from 3,253 vessels in 1981 to 793 in 1988, according to the 1989 Annual Shipyard Survey conducted by the American Waterways Shipyards Conferences (AWSC). In 1989, the number of vessels constructed was 757.

The repair business for this industry continued to improve during 1989 with the rise in contracts for the repair of river and offshore barges. The industry experienced a 37 percent increase in the number of river barges repaired and a 5 percent rise in the repair of offshore barges. In total, 1989 repair activity experienced an overall increase of 20 percent.

According to the 1989 survey of second-tier yards, employment levels peaked in 1981 at 24,699 and subsequently declined by 54 percent to a low of 11,393 in 1984. Since 1984, employment in these yards has gradually increased each year until it dropped again in 1988 to a level of 11,424. In 1989, employment increased 15 percent to 13,478.

Capital Investment

During FY 1990 the U.S. ship construction and ship repair industry invested more than $210 million in the upgrade and expansion of facilities. Much of this investment was to improve efficiency and competitiveness in the Navy's construction, repair, and overhaul projects, which are considered the most consistent and stable element in the industry's projected market. In 1991, however, the industry plans to spend only $91 million, according to data received by the Maritime Administration. The industry's capital investments since 1970 have totaled $4.6 billion, and actual expenditures between 1985 and 1989 have consistently exceeded those planned, as indicated in Table 4.

Table 4: Capital Investments by the U.S. Shipbuilding and Repair Industry, 1985–91

(in millions of dollars)

Fiscal Year	Actual Expenditures	Planned Expenditures
1991	—	91
1990	210	250
1989	196	65
1988	145	70
1987	150	50
1986	225	105
1985	252	159

SOURCE: U.S. Department of Transportation, Maritime Administration.

These capital investments have included building basins, floating drydocks, cranes, automated equipment, and highly mechanized production systems. The emphasis has been on introducing modular techniques—fabrication of large subassemblies and pre-outfitting of ship components.

Outlook for 1991

Projections for 1991, in constant dollars, show an increase of less than one-half of 1 percent of the value of work completed by the industry (SIC 3731) in 1990. As of January 1991, only three merchant vessels (1,000 gross tons or over) were expected to be on order in U.S. shipyards as a result of the depressed U.S. commercial ship market.

Navy shipbuilding, conversion, and repairs will continue to dominate the industry's product value. For fiscal year 1991 the Navy has requested funds for the construction of 15 new ships. The FY 1991 budget request for Navy shipbuilding and conversion (SCN) is $11.2 billion. This request is $400 million less than was appropriated for FY 1990. In light of recent domestic and international events, this budget request and the number of ships to be procured are subject to change.

The funding for FY 1991 Navy ship repair and modernization of naval vessels will be reduced 15 percent from the FY 1990 appropriation. This years' request is for $3.9 billion compared to $4.6 billion in FY 1990. Both public and private shipyards will be affected by the reduced repair budget. Table 2 shows how the repair and maintenance dollars are intended to be allocated in FY 1991, in addition to showing the appropriations for the three previous fiscal years. Public (naval) shipyards and private shipyards will compete for some of the repair funds, but the majority of this budget will be allocated between the sectors. Based on these data the Navy is targeting at least 37 percent of its FY 1991 budget to private shipyards and 50 percent to the public sector. The remaining 13 percent will be competed for by the two sectors.

Long-Term Prospects

First-Tier Shipyards

Although employment in the Active Shipbuilding Base (ASB) through calendar year 1994 and beyond will continue to be supported primarily by U.S. Navy funding, the ASB alone will not sustain the present employment level as indicated in Figure 23-2.

The goal of attaining a 600-ship naval force has been abandoned. Some Pentagon planners are predicting that during the next decade the size of the U.S. naval fleet will be reduced from its current level of about 550 to 450.

Table 5: Projected Ship Construction by the U.S. Navy Fiscal Years 1991–94

Symbol	1991	1992	1993	1994	Total
New Construction					
Trident	1	1	1	1	4
SSN-21	2	—	6	—	8
DDG-51	5	10	—	10	25
LSD-41	1	1	1	1	4
LHD-1	1	—	1	—	2
MHC	3	4	5	—	12
T-AGOS	—	2	3	—	5
AGOS	—	1	—	2	3
AE	—	—	1	2	3
ARS	—	—	—	1	1
AOE	1	—	3	—	4
AGOR	1	2	1	2	6
AR	—	—	—	1	1
LCAC*	(12)	(12)	(12)	(11)	(59)
Subtotal	15	21	22	20	78
Conversion					
CV SLEP	—	—	1	—	1
Subtotal	—	—	1	—	1
Total	15	21	23	20	79

*LCAC=Air-Cushioned Landing Craft. Figures are not included in subtotal and total.
SOURCE: U.S. Department of the Navy.

The U.S. Navy plan for fiscal years 1991 through 1994 includes construction of 78 new ships and one service life extension project (SLEP) as illustrated in Table 5. More than $45 billion is proposed for the 5-year plan. Shipyard contract value, however, corresponds to only about a third of this budget. The remainder is attributed to such items as Government-furnished equipment placed aboard the vessels and to Government program costs.

Increasing orders for merchant ships, worldwide, may provide some opportunities for U.S. shipyards. In addition, there are likely to be increasing opportunities for U.S. shipbuilders in the 1990's as a result of the Oil Pollution Act of 1990; a program to build fast sealift ships; the elimination of subsidies to foreign shipbuilders; and a growing demand for replacement of aging ship tonnage.

In FY 1990, the Congress authorized $600 million for the Navy to begin a fast sealift ship construction program. Currently, the Navy has only eight sealift vessels in its inventory. Of the $600 million Congress originally authorized for the fast sealift ship construction program, $375 million remains available since $225 million was reprogrammed by Congress to meet various shortfalls in on going programs.

The importance of strategic sealift capability w mally recognized in 1984 when the Secretary of the gave it equal status with the Navy's three main funct sea control, power projection and strategic deterren

The Navy's current task is to determine what m features need to be incorporated into the new gene sealift ships. Meanwhile, MARAD continues to seek from U.S. flag operators to make these ships comme viable. MARAD or the U.S. Navy will administe contracts to build these ships depending on their con cial viability and the availability of funds.

The Persian Gulf situation has highlighted the nee adequate sealift resources. In light of the experience o large sealift operation, it would appear that sealift wil charged topic in the years ahead, and future pla decisions could translate into significant opportunitie U.S. shipyards.

For more than a decade, environmentalists have pressing Congress to enact comprehensive oil-spill leg tion. On August 18, 1990, President Bush signed into the Oil Pollution Act of 1990, which includes the req ment that all tankers entering U.S. ports have double- by the year 2015.

In order to meet the double-hull objective, the new puts in place a phase-out schedule, effective Janua 1995, for all existing single-hull tankers, based on vessel's age and gross tonnage. All single-hull tankers be prohibited from entering U.S. ports after Janua 2010; all other tankers—either double bottoms or do sides—will be prohibited from entering U.S. ports January 1, 2015. All new construction for domestic se must be double-hulled. The law incorporates exemp for tankers lightering to smaller vessels more than 60 off the coast, and tankers that use the Louisiana Offs Oil Port. (Lightering is the process of offloading carg smaller vessels outside of a port.)

The Oil Pollution Act of 1990 affects the existing tanker fleet, as well as foreign flag tankers entering U.S. p By August 1991, the Secretary of Transportation must d mine whether other structural and operational tank requirements could provide protection to the environ equal to or greater than that provided by double-hulls.

It is not known how many tankers will be rebuilt, scrap or constructed as a result of the Oil Pollution Act of What is known, according to Maritime Administration is that in 1989 approximately 1500 tankers involved in fo trade—or about one-third of the world petroleum t fleet—entered U.S. ports.

The world tanker fleet is aging. By the year 2000, ov percent of the current world tanker fleet will be more 25 years old, and over 20 percent will be at least 30 years A heavy concentration of tankers, 25 percent by number 50 percent by tonnage, were built between 1972 and Many of these ships are likely be replaced with new shi the 1990's.

The U.S. domestic tanker fleet was comprised of petroleum tankers totaling 4.8 million gt, as of Augu 1990. Approximately two-thirds of these tankers will b years old by the year 2000; about 45 percent will be than 30 years old. As a result of the Oil Pollution A 1990, U.S. shipyards could have opportunities in the ahead to build or retrofit replacement tonnage.

Recent shipbuilding forecasts indicate that the demand for commercial ships will increase significantly in the 1990's. The primary reason for the optimistic forecast is the need for new ships to replace the world's aging merchant fleet. Some forecasts envision the world fleet doubling by the year 2000.

The United States has been attempting, through the Organization for Economic Cooperation and Development (OECD), to eliminate all subsidies, worldwide, to the shipbuilding industry by the end of 1991.

It is generally believed that, without subsidies to the competing foreign shipyards, U.S. shipyards would be better able to compete in the world market. With years of experience in building highly complex Navy combatants, several U.S. shipyards have the know how, to build sophisticated commercial tonnage, especially chemical carriers, LNGs, cruise ships, roll-on/roll-off vessels, and containerships.

Second-Tier Shipyards

The outlook for barge construction should gradually become more favorable through the middle to late 1990's. The barge and towboat fleets are aging, and surviving operators will be looking to upgrade their equipment. However, a return to the boom times of the early 1980's in new construction is highly unlikely unless major markets develop for export of grain and coal. The recently enacted law requiring the double-hull construction of tank barges, while not in effect until 2015, may promote the orderly retirement and replacement of existing single-hull tank barges. All new construction for domestic trade service must be double-hulled.

Higher oil prices and possible shortages of petroleum will stimulate the demand for exploratory drill rigs and support-vessels for the offshore oil industry. Sustained demand for the repair and replacement of drilling rigs and support-vessels would result in the gradual improvement in second-tier shipyard employment.—*William G. Kurfehs, Daniel Seidman, and Thomas H. Vodicka, Office of Ship Construction, Maritime Administration, U.S. Department of Transportation, (202) 366-5841, October 1990.*

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24

Industrial and Analytical Instruments

Industrial and analytical instrument shipments are estimated to have increased to $30 billion in 1990, reflecting a constant-dollar decline of 1 percent. The 1991 growth rate is forecast to approach 2 percent, a pace that should continue the next two years before increasing modestly during the 1994-1995 period.

The major product areas included in the industrial and analytical instrument industry are laboratory instruments and apparatus, measuring and controlling instruments, and instruments to measure electricity. Instruments comprise a significant portion of expenditures under both research and development (R&D) programs and investment in new plant and equipment, and shipments generally parallel capital investment and R&D funding. The slight 1990 sales decrease followed the 4 percent rise of 1989. The decline in instrument product shipments was caused by a drop in electrical test instrument shipments, while other instrumentation areas experienced modest growth.

Before reading this chapter, please see "How to Get the Most Out of This Book" on page 1. It will clarify questions you may have concerning data collection procedures, factors affecting trade data, forecasting methodology, the use of constant dollars, the difference between industry and product data, sources and references, and the Standard Industrial Classification (SIC) system. For other topics related to the subject of this chapter, see chapters 5 (Construction), 12 (Chemicals and Allied Products) 19 (Metalworking Equipment), 22 (Aerospace), 28 (Computer Equipment and Software), and 45 (Drugs).

Increased spending for real plant and equipment has supported industrial and analytical instrument sales. Facing a growing import challenge and increased competition in foreign markets, many U.S. manufacturers have invested in new and improved production facilities to allow them to remain competitive. Instrument sales also are supported as U.S. industries strive to limited pollution and waste from their production processes.

The rate of R&D growth continued to slow in 1990, with private funds estimated to have increased less than 10 percent while government expenditures grew 4 percent. Industrial sectors that have shown strong R&D support in recent years include computers, software, office-equipment and biotechnology. Whereas earlier R&D efforts focused on new product development, U.S. manufacturers are now allocating a larger percentage of funds to meet environmental and product safety requirements as government regulation and liability concerns increase.

The instrument industry continues to be influenced by microprocessor and computer technology. As more microprocessor-controlled "smart" instruments are developed, there is a growing trend toward more accuracy in measurements and augmenting computer networks to coordinate the instruments and the processes they control. These networks are being tied into larger plant and company information management systems allowing for more efficient and effective utilization of production processes. Domestic instrument manufacturers are beginning to face stiff competition from U.S. computer and software companies as the importance of network and data management systems increases. Improvements in sensor technology will allow for more accurate readings which will improve analysis and control of materials and products and lead to additional use of microprocessor-driven instruments and networks.

INTERNATIONAL COMPETITIVENESS

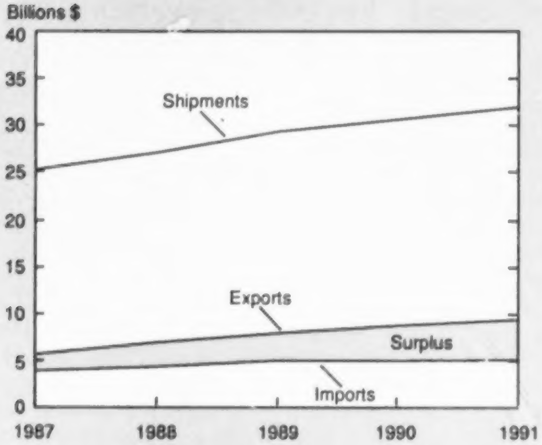
As domestic instrument market growth has slowed, exports have begun to play an increasing role in instrument industry sales. Exports are estimated to have comprised 29 percent of 1990 instrument shipments, providing most of the growth in that area. In 1989, exports represented 27 percent of industry shipments. Instrument exports increased 10 percent in 1990 while imports inched up 2 percent. Continued rapid export growth supported further improvement in the U.S. instrument trade surplus, which rose to $4.2 billion in 1990 from $3.5 billion in 1989.

The European Community (EC) imported $2.6 billion in U.S. instruments in 1990. U.S. imports of EC instruments grew only 3 percent to $1.5 billion. The EC thus continued to provide a significant share of the U.S. instrument trade surplus. The rate of increase in EC demand slowed, however, to 5.6 percent in 1990 from almost 10 percent in 1989.

The EC effort to create a single, unified market by 1992 provides U.S. instrument manufacturers with an opportunity to increase their penetration of the European market. With more than 325 million people and a nearly $4.5 trillion economy, the unified EC will offer the largest single market in the world. The elimination of multiple customs requirements, standards, and regulatory procedures is expected to stimulate substantial economic growth, generating related increases in capital and R&D expenditures.

While these changes could help U.S. firms sell in Europe, they also should result in increased competition from European and other instrument producing countries. If U.S. instrument manufacturers are to continue a substantial trade surplus with Europe, they will have to move quickly to take advantage of the opportunities presented.

Figure 24-1
Shipments, Exports and Imports of Industrial & Analytical Instruments



Source: U.S. Department of Commerce, International Trade Administration and Bureau of the Census.

Firms that wait until 1992 to pursue burgeoning European markets will probably find they are too late. U.S. manufacturers should monitor EC activities to ensure that standards and rules of origin are not used as barriers to U.S. instrument sales.

Canada grew in importance in U.S. instrument trade in 1990. Exports of U.S. instruments to Canada rose to $1.4 billion, while imports of Canadian instruments increased to just over $400 million. The U.S. instrument trade surplus with Canada grew to $1 billion in 1990. The U.S.-Canada Free Trade Agreement and capital investments related to it may have contributed to the increase in instrument trade between the two countries. Available 1990 trade information is incomplete, however, and thus cannot provide a definitive explanation of the increase.

Japan continues to be a major instrument trading partner for the U.S., although both exports and imports fell in 1990. U.S. exports to Japan declined to $1.18 billion from $1.26 billion in 1989 while imports dropped to $1.38 billion from $1.47 billion. The U.S. trade deficit with Japan in 1990 was $193 million, down from $211 million in 1989. The drop in exports to Japan was limited to instruments to measure electricity while the drop in imports was in both instruments to measure electricity and laboratory instruments and apparatus. U.S. trade with Japan in instruments to measure electricity appears to have been affected by Japanese investment in U.S. production facilities and a lull in Japanese construction of semiconductor production facilities in preparation for a switch from 1 megabit (Mb) to 4 and 16 Mb technologies.

(Note: The 1989 implementation of the Harmonized System (HS) for the categorization of exports and imports significantly changed the manner in which trade data were classified. As a result, 1989 and 1990 trade data are not directly comparable with prior statistics. Comparisons of 1989 and 1990 data with earlier year trade information is provided as a rough guide to trade trends and should not be relied upon for detailed analysis. In addition, the method for gathering data used to determine U.S. exports to Canada was changed in 1990. Although the new data more accurately report the level of such trade in 1990, it also exaggerates the rate of growth in U.S. exports to Canada between 1989 and 1990. The change is also likely to have overstated the rate of growth of total U.S. exports in all instrument categories for that period. Please see chapter 1, "How to Get the Most Out of This Book" for a more detailed explanation of this change.)

Table 1: U.S. Trade in Industrial and Analytical Instruments by Major Product Categories, 1989 Through 1991

Item	1989	1990[1]	1991[2]	Percent Change 1989-90	Percent Change 1990-91
Laboratory Instruments					
Value of exports	4,309	4,733	5,170	9.8	9.2
Value of imports	2,659	2,725	2,823	2.5	3.6
Measuring and Controling Instruments					
Value of exports	1,442	1,874	2,083	29.9	11.2
Value of imports	1,224	1,291	1,346	5.5	4.2
Instruments to Measure Electricity					
Value of exports	2,177	2,065	2,150	−4.2	3.1
Value of imports	517	491	500	−5.0	1.8

[1] Estimate based on partial year data.
[2] Forecast.
SOURCE: U.S. Department of Commerce, International Trade Adminstration

Outlook for 1991

Instrument industry shipments should grow by nearly 2 percent in constant-dollar values in 1991, compared to the 1 percent decline in 1990. Exports are expected to provide a significant share of sales growth with moderate domestic economic expansion and slightly increased R&D expenditures also contributing. Imports are not expected to increase significantly during the year. Total R&D spending may fall and impede instrument sales increases if U.S. Government R&D expenditures are cut substantially. U.S. economic growth and thus instrument sales could slump if oil import costs continue to rise.

Long-Term Prospects

Moderate economic growth and increases in R&D combined with expanding exports are expected to bolster U.S. instrument shipments in the years ahead. While the constant-dollar rate of expansion for 1992 and 1993 is expected to be a relatively modest 2 percent, slightly larger increases are expected in 1994 and 1995.

Factors supporting growth will include stronger environmental protection requirements and pressure on manufacturers to improve the quality of their production processes and products. Instruments will continue to improve in the number of substances they are able to analyze, the specificity with which they can identify the nature and amount of the substances they detect, and in their ability to analyze and communicate findings to instrument networks and computer-driven integrated management systems. Manufacturers will have to upgrade their instrumentation systems to keep pace with customer quality and service requirements.

In addition to traditional export partners, U.S. instrument manufacturers should be looking at potential markets in Eastern Europe and the Soviet Union. As those nations rebuild their economies and export controls are relaxed, major opportunities should arise for instrument sales, especially in the process control area. Although the current state of these economies will limit short-term sales, U.S. firms that begin establishing relationships now will be more likely to have success when trade does increase.—*Lewis R. Podolske, Office of Microelectronics and Instrumentation, (202) 377-3360, October 1990.*

LABORATORY INSTRUMENTS AND APPARATUS

The laboratory instruments and apparatus category is made up of four industries: laboratory apparatus and furniture (SIC 3821), including balances, centrifuges, and dryers; analytical instruments (SIC 3826), such as chromatographs, spectrometers and photometers; optical instruments and components (SIC 3827), with lenses, microscopes, telescopes, and profile projectors; and measuring and controlling instruments not included in other classifications (SIC 3829), including surveying, mechanical property testing, hydrometer, and radiation detection instruments.

Total product shipments for these industries reached nearly $12.2 billion in 1990 compared with $11.5 billion in 1989, an increase of more than 2.6 percent in constant-dollar value. Domestic market growth was responsible for much of the gain while exports continued to provide stimulus for increased laboratory instruments and apparatus shipments. U.S. exports rose from $4.3 billion in 1989 to $4.7 billion in 1990, up 9.8 percent. During the same period, imports grew from $2.66 billion to $2.73 billion, a 2.5 percent increase. The 1990 trade surplus reached $2 billion, nearly 22 percent higher than the 1.65 billion 1989 figure.

U.S. laboratory instruments and apparatus sales were fueled by continued modest investment in new plant and equipment by domestic manufacturers and increases in private sector and government R&D expenditures. The analytical instruments industry led this sector with 1990 shipments expanding nearly 8 percent to $4.6 billion compared with less than $4.3 billion in 1989. These increases amounted to more than 4 percent in constant-dollar value. Measuring and controlling instrument industry shipments were up more than 6 percent to $4.5 billion, which equates to 2.8 percent growth in constant-dollar terms. Optical instruments and components and laboratory apparatus shipments rose 4.3 percent representing minimal constant-dollar increases.

Expansion of laboratory instruments and apparatus shipments was supported by healthy growth in the pharmaceutical, food processing, and bio-technology industries. Limited increases in R&D and investment in plant and equipment by the chemical and petroleum industries, major users of such equipment, also helped sales, while public utility purchases were relatively flat. Environmental monitoring and new materials research continued to expand across a number of industries, while private testing laboratories, including drug analysis, are a growing market.

Government R&D expenditures continue to support laboratory instruments and apparatus sales. The focus of these efforts however, is shifting toward such major projects as the Superconducting Super Collider, the Strategic Defense Initiative, and AIDS research, with less emphasis on more traditional research programs. Government R&D spending increases have been moderated by budget constraints.

The U.S. analytical instrument industry continues to be the world leader in both sales and technology development. Areas of product development include automation of sample preparation and handling, increased sensitivity and speed in analysis, and the incorporation of instruments into laboratory and company data management systems. Laboratory instrument manufacturers are penetrating traditional process control markets with on-line analytical instruments as their customers require faster and more accurate data to improve control of production processes for better quality and less waste. At the same time, computer companies and software producers are beginning to compete in some analytical instrument markets, especially in the areas of networking and integrated data management systems.

High performance capillary electrophoresis (HPCE) instruments continue to exhibit strong growth potential, especially as the difficulties associated with a new technology are resolved. The miniaturization of instruments continues to be a major focus as the cost of laboratory space and the need to place instruments "on-line" for faster and more accurate measurements continues. Improvements in sensor technology also are expected to be an area of

Trends and Forecasts: Laboratory Instruments (SIC 3821, 3826–7, 3829)

(in millions of dollars except as noted)

Item	1987	1988[1]	1989[2]	1990[2]	1991[3]	Percent Change 1987–88	Percent Change 1988–89	Percent Change 1989–90	Percent Change 1990–91
Industry Data									
Value of shipments[4]	10,543	11,773	12,757	13,529	14,410	11.7	8.4	6.1	6.5
Value of shipments (1987$)	10,543	11,504	12,115	12,446	12,901	9.1	5.3	2.7	3.7
Total employment (000)	109	115	118	121	—	5.5	2.6	2.5	—
Production workers (000)	54.6	57.6	59.5	61.1	—	5.5	3.3	2.7	—
Average hourly earnings ($)	10.75	10.77	11.13	11.45	—	0.2	3.3	2.9	—
Capital expenditures	365	446	—	—	—	22.2	—	—	—
Product Data									
Value of shipments[5]	10,155	10,609	11,490	12,179	12,970	4.5	8.3	6.0	6.5
Value of shipments (1987$)	10,155	10,364	10,912	11,197	11,614	2.1	5.3	2.6	3.7

[1] Advance data from the 1988 Annual Survey of Manufactures.

[2] Estimate.

[3] Forecast.

[4] Value of all products and services sold by establishments in the laboratory instruments industry.

[5] Value of products classified in the laboratory instruments industry produced by all industries.

SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA). Estimates and forecasts by ITA.

concentration as manufacturers seek instruments with greater sensitivity, an improved ability to operate in harsh environments, and the capability to communicate to instruments, networks, and data management systems.

The optical instruments and components industry is of major importance to numerous military and commercial technologies. The U.S. optics industry continues to face strong international competition while both imports and exports declined in 1990. Imports account for more than one-third of U.S. optics purchases. In 1990, U.S. optics imports totalled $807 million, while exports were $705 million.

The need to integrate optical instruments and devices into networks and operating data systems provides domestic manufacturers with an opportunity to regain optics market share if they are able to utilize U.S. leadership in microprocessor, computer, and software technology. Visible diode laser (VDL) technology offers a combination of small size, ruggedness, and low power requirements and should be an area of rapid technological development and market growth. In another cross-industry area of development, lasers and electro-optics are expected to find increasing use in analytical instrument applications because of their potential for combining greater accuracy and smaller size.

INTERNATIONAL COMPETITIVENESS

As U.S. economic growth slows, exports continue to play a major role in laboratory instruments and apparatus sales, accounting for more than 35 percent of industry shipments. The EC is the largest U.S. trading partner in laboratory instruments. U.S. sales to the EC increased 9 percent, to $1.5 billion in 1990, nearly a third of all exports. U.S. imports from the EC were $936 million, up 8 percent from 1989. The U.S. trade surplus with the EC grew from $519 million in 1989 to $576 million in 1990.

Table 2: U.S. Trade in Laboratory Instruments and Apparatus With Major Partners, 1989 and 1990

(millions of dollars)

Destination/ Source	Exports		Imports	
	1989	1990[1]	1989	1990[1]
European Community	1,386	1,512	867	936
Canada	NA[2]	611	123	137
Mexico	174	172	48	36
Japan	683	695	1,066	1,007
World	4,309	4,733	2,659	2,725

[1] Estimate based on partial year data.

[2] 1989 data not furnished because of change in methodology for gathering data that began in 1990.

SOURCE: U.S. Department of Commerce, International Trade Administration.

Canada continues to be an important trading partner in the laboratory instrument area in 1990. U.S. exports to Canada increased to $611 million in 1990. Imports from Canada during this period grew from $123 million in 1989 to $137 million in 1990, thereby increasing the U.S. trade surplus with Canada to $474 million. U.S. trade with Canada was marked by expansion in exports of analytical instruments, optical instruments, and measuring and controlling instruments not elsewhere classified.

Japan remains a major contributor to U.S. laboratory instrument trade. U.S. exports to Japan rose to $695 million in 1990, up 2 percent from $683 million in 1989. Imports from Japan actually dropped 6 percent, from $1.07 billion in 1989 to $1.01 billion in 1990. The laboratory instruments trade deficit with Japan remained significant, at $312 million.

Outlook for 1991

Laboratory instrument shipments should experience slightly higher growth, expanding 3.7 percent in constant-dollar value in 1991. This forecast is predicated on continued moderate growth in the economy, slowly increasing U.S. manufacturer plant and equipment investments and R&D expenditures, and increased Government R&D. Foreign markets will provide a significant share of 1991 sales, with U.S. exports expected to grow more than 9 percent.

Long-Term Prospects

The laboratory instruments and apparatus industries should experience stable growth at about a 4 percent constant-dollar rate through 1995. Moderate growth in the economy and in capital and R&D expenditures combined with increased emphasis on environmental monitoring, energy conservation, and new materials development should stimulate domestic markets. The need for new technological approaches to meet the requirements of the pharmaceutical and bio-medical industries will also support growth. Major government R&D programs should support additional product development and market growth if they remain strongly funded. Additional opportunities will arise as laboratory instruments make further inroads into traditional process control markets. Producers of optical instruments and components will face continued stronger international competition and the prospect of a further decline in market share.

Exports will continue to provide a significant share of the growth in shipments of laboratory instruments, even though U.S. manufacturers will encounter challenges from foreign competitors. EC 92 will offer significant opportunities for greater U.S. participation in that market, and the economic liberalization of Eastern Europe and the Soviet Union should provide additional sales as the rebuilding of those economies progresses.—*Lewis R. Podolske, Office of Microelectronics and Instrumentation, (202) 377-3360, October 1990.*

MEASURING AND CONTROLLING INSTRUMENTS

Three industries comprise this category: environmental controls (SIC 3822), including thermostats and heating/air conditioning system controls; process controls (SIC 3823), such as meters to measure rates of liquid or gas flow, instruments to measure liquid levels and pressure gauges for the automatic control of production processes; and fluid meters and counting devices (SIC 3824), with gas and liquid meters and speedometers. Product shipments for this category rose to $10.2 billion in 1990 from $9.7 billion in 1989, an increase of less than 2 percent in constant-dollar value. This sluggish expansion was common to all three industries as only fluid meters and counting devices exhibited more than 2 percent growth. Exports were responsible for a major portion of growth in shipments, rising from $1.44 billion in 1989 to $1.87 billion in 1990. In the case of environmental controls, the increase in exports, $130 million, was greater than the $105 million total increase in product shipments.

Trends and Forecasts: Measuring and Controlling Instruments (SIC 3822-4)

(in millions of dollars except as noted)

Item	1987	1988[1]	1989[2]	1990[2]	1991[3]	Percent Change 1987-88	1988-89	1989-90	1990-91
Industry Data									
Value of shipments[4]	7,796	9,265	10,131	10,632	11,033	18.8	9.3	4.9	3.8
Value of shipments (1987$)	7,796	9,028	9,549	9,718	9,860	15.8	5.8	1.8	1.5
Total employment (000)	90.0	96.8	102	101	—	7.6	5.4	-1.0	—
Production workers (000)	51.8	56.6	59.6	58.3	—	9.3	5.3	-2.2	—
Average hourly earnings ($)	10.15	10.39	10.63	10.91	—	2.4	2.3	2.6	—
Capital expenditures	230	233	—	—	—	1.3	—	—	—
Product Data									
Value of shipments[5]	7,529	8,847	9,675	10,152	10,531	17.5	9.4	4.9	3.7
Value of shipments (1987$)	7,529	8,610	9,125	9,284	9,418	14.4	6.0	1.7	1.4

[1] Advance data from the 1988 Annual Survey of Manufactures.

[2] Estimate.

[3] Forecast.

[4] Value of all products and services sold by establishments in the measuring and controlling instruments industry.

[5] Value of products classified in the measuring and controlling instruments industry produced by all industries.

SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA). Estimates and forecasts by ITA.

U.S. measuring and controlling instruments sales were supported by continued moderate increases in new plant and equipment investments by domestic manufacturers. Sales also are closely related to the fortunes of the major processing industries. Expansion in the pharmaceutical, food processing, petroleum, and chemical industries led the way in purchases of measuring and controlling instruments purchasers. Sales to the pulp and paper and utility industries were more restrained in 1990.

Residential and nonresidential construction continued to decline in 1990, slowing sales of environmental controls that are used primarily to control heating and air conditioning systems. The existing glut in downtown office buildings was joined by slowdowns in residential and suburban commercial construction. Home improvement activities were the only growth area in private residential contruction while industrial buildings and hotels provided increases in nonresidential construction.

The measuring and controlling instrument industries face the strongest challenge from the trend to incorporate microprocessors into instruments and tie those instruments into networks and data/production management systems. Encountering strong import and price competition, U.S. manufacturers require instrumentation systems that provide more accurate measurements, conduct analysis, and identify problems and correct those problems quickly, preferably in real time. Microprocessors help to meet those needs. They enable individual instruments to measure more quickly and accurately, allow the development of multifunction instruments, improve the ability of instruments to communicate their measurements, and permit the networking of instruments and their incorporation into process and data management systems. U.S. measuring and controlling instrument producers face the challenge of creating their own lines of microprocessor controlled instruments, networks, and data management systems or else teaming with computer and software companies to jointly develop such products. Computer manufacturers have already established a strong presence in the measuring and controlling industry through their PC and professional engineering product lines while software companies are expanding their efforts in network integration and control. The need for greater accuracy and "smarter" instruments is also allowing analytical and scientific instrument manufacturers to expand into the measuring and control area.

INTERNATIONAL COMPETITIVENESS

With domestic markets stagnating, U.S measuring and controlling instrument producers derived most of their sales growth from exports. While industry shipments incrased 5 percent to $10.6 billion in 1990, exports apparently grew 30 percent to $1.9 billion. Changes in the manner in which 1990 exports to Canada were determined possibly exaggerated their growth. The reported $430 million rise in exports would account for almost all of the $500 million gain in industry shipments. During this same period, imports expanded 5.5 percent to $1.3 billion.

Canada became the leading U.S. trading partner in measuring and controlling instruments in 1990. Exports to Canada grew to $579 million, while imports increased 27 percent, to $219 million. The resulting $360 million trade surplus accounted for more than 60 percent of the total U.S. trade surplus in measuring and controlling instruments. Exports to Canada rose in most sectors, with the greatest increase taking place in fluid meters and counting devices. Imports from Canada rose significantly only in environmental controls where they almost doubled.

The EC continued as a major factor in U.S. measuring and controlling instruments trade with 1990 exports growing 8 percent to $395 million while imports fell 5 percent to $373 million. The U.S. thus shifted to a trade surplus with the EC after running a deficit in 1989. Exports increased in process control instruments while imports of environmental controls declined.

Japan is a smaller trading partner in these products than Canada and the EC, but still manages to run a significant

Table 3: U.S. Trade in Measuring and Controlling Instruments with Major Partners, 1989 and 1990

(millions of dollars)

Destination/ Source	Exports 1989	Exports 1990[1]	Imports 1989	Imports 1990[1]
European Community	366	395	394	373
Canada	NA[2]	579	172	219
Mexico	246	331	197	210
Japan	117	122	212	232
World	1,442	1,874	1,224	1,291

[1] Estimate based on partial year data.

[2] Data for 1989 not furnished because of change in methodology for gathering data that began in 1990.

SOURCE: U.S. Department of Commerce, International Trade Administration.

trade surplus with U.S. Imports from Japan grew 9 percent, to $232 million in 1990, while U.S. exports to Japan rose only 4 percent, to $122 million. Increased imports were concentrated in environmental controls and fluid meters and counting devices. U.S. exports fell in environmental controls and increased in process controls.

Outlook for 1991

Measuring and controlling instruments should experience limited growth in 1991, with product shipments expected to increase less than 1.5 percent in constant-dollar terms. The environmental control industry is expected to lag behind as continuing construction industry weakness limits sales. Construction of nonresidential commercial and industrial projects, users of the most sophisticated and costly environmental control syustems, are expected to be hardest hit. The slowdown in the commercial and industrial construction industries is expected to affect sales of environmental control systems particularly hard. The slowdown in industrial construction is expected to retard shipments of process controls and fluid meters and counting devices. Although export growth will be less strong than in 1990, exports are expected to provide most of the stimulus for shipment increases.

Long-Term Prospects

Growth in the measuring and controlling instruments sector will continue to be limited through 1995. Shipments are expected to increase at a compound rate of 2 percent a year in constant-dollar terms. Lingering weakness in the construction industry will depress sales of environmental controls. Export opportunities in the EC, Eastern Europe, and the Soviet Union should help to compensate for weakness in the domestic market.

Process controls and fluid meters and counting devices should benefit from continued investment in plant and equipment upgrades as U.S. manufacturers encounter increased foreign competition. The extent to which U.S. producers improve their products to meet the needs of their customer base will determine the degree to which they maintain their market share in the face of strong international competition and challenges from the computer, software, and analytical instrument industries.

The economic intergration of Western Europe and the opening of East European and Soviet Union markets offer strong potential to U.S. producers. EC92 will simplify U.S. manufacturers' approach to Europe as they meet a single set of requirements rather than numerous country-specific regulations. The effort to modernize the Eastern bloc economies will require massive investments in measuring and controlling instruments. If U.S. firms move quickly to position themselves, they should obtain a significant share of these markets.—*Lewis R. Podolske, Office of Microelectronics and Instrumentation, (202) 377-3360, October 1990.*

INSTRUMENTS TO MEASURE ELECTRICITY

The value of shipments of electrical test and measuring instruments (SIC 3825) declined by 5 percent in 1990. A relatively mature market and a reluctance by defense contractors and manufacturers to spend money on test and measurement equipment contributed to the soft market. The outlook for 1991 is for a slight upturn in domestic and overseas markets, with shipments returning close to their 1989 level.

Electrical test instruments include signal generating equipment (approximately 4 percent of shipments), communications test equipment (20 percent), oscilloscopes and spectrum analyzers (10 percent), automatic test equipment for components and printed circuit boards (40 percent), panel type electrical indicating instruments (10 percent), parts and other (16 percent).

Growth projections for these instruments reflect the broad range of industries served by equipment that measures electricity. Industry shipments fell in 1990, to $7.9 billion. Companies lacking a strong reputation for quality and performance suffered in 1990. Many companies in the electrical test industry were forced to cut overhead expenses and consolidate product lines. Employment declined by nearly 4,000, with non-production workers affected the most.

U.S. companies producing automatic test equipment (ATE) had a slow year in 1990. Domestic consumption was down, with few semiconductor producers expanding domestic fabrication lines, and soft demand from the defense establishment.

Both U.S. and world market shares for ATE are heavily concentrated among a handful of producers, each known for its expertise in either logic, memory, or linear test equipment. Given the high cost of developing a new product, market share is critical to generate the profits needed to support high

Trends and Forecasts: Instruments to Measure Electricity (SIC 3825)

(in millions of dollars except as noted)

Item	1987	1988[1]	1989[2]	1990[2]	1991[3]	Percent Change 1987-88	1988-89	1989-90	1990-91
Industry Data									
Value of shipments[4]	7,703	7,926	8,322	7,906	8,143	2.9	5.0	−5.0	3.0
Value of shipments (1987$)	7,703	7,860	7,941	7,233	7,206	2.0	1.0	−8.9	−0.4
Total employment (000)	85.2	82.0	83.8	80.2	—	−3.8	2.2	−4.3	—
Production workers (000)	43.9	41.6	42.4	40.7	—	−5.2	1.9	−4.0	—
Average hourly earnings ($)	11.00	11.46	11.80	12.22	—	4.2	3.0	3.6	—
Capital expenditures	308	213	—	—	—	−30.8	—	—	—
Product Data									
Value of shipments[5]	7,612	7,652	8,036	7,633	7,862	0.5	5.0	−5.0	3.0
Value of shipments (1987$)	7,612	7,553	7,667	6,984	6,958	−0.8	1.5	−8.9	−0.4

[1] Advance data from the 1988 Annual Survey of Manufactures.

[2] Estimate.

[3] Forecast.

[4] Value of all products and services sold by establishments in the instruments to measure electricity industry.

[5] Value of products classified in the instruments to measure electricity industry produced by all industries.

SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA). Estimates and forecasts by ITA.

research and development costs. These costs prevent newcomers from entering the market and are responsible for the growing concentration of market share.

Supplier strength appears to follow that of the user market. As the Japanese now dominate the production of dynamic random access memory devices (DRAMs) so do they control the majority of the memory test market. U.S. companies are strongest in traditional linear and mixed signal test equipment, and have a declining share of the market for memory testers.

INTERNATIONAL COMPETITIVENESS

The U.S. trade surplus in electrical test and measurement equipment declined by 4 percent in 1990, to $1.6 billion. Exports fell 4 percent, while imports declined 5 percent. Although imports from Canada grew 18 percent, this increase was more than offset by a decline in imports from Japan (specifically equipment to test engines, and automatic test equipment). Although exports provided strong sales potential in the first half of 1990, all overseas markets rapidly softened in the third and fourth quarters.

Table 4: U.S. Trade in Electrical Test Instruments With Major Partners, 1989 and 1990

(millions of dollars)

Destination/ Source	Exports		Imports	
	1989	1990[1]	1989	1990[1]
European Community	697	678	186	178
Canada	NA[2]	219	43	51
Mexico	85	70	12	20
Japan	455	366	188	137
World	2,177	2,085	517	491

[1] Estimate based on partial year data.

[2] Data for 1989 not furnished because of change in the statistical basis in 1990.

SOURCE: U.S. Department of Commerce, International Trade Administration.

Part of the decline in Japanese imports may be explained by the growth of that country's investment in the United States. In 1989, Japan's largest producer of ATE began production in Illinois. In 1990, a Japanese company took over a majority interest in one of this country's largest producers of linear test equipment. Nine U.S. electrical test equipment facilities are now owned by Japanese firms, which together employ more than 4,000 workers.

A soft domestic market forced companies to search for sales opportunities overseas. For the first half of 1990, most overseas markets experienced healthy growth rates of at least 10 percent. Unfortunately, this positive trend reversed in the second half of the year. A few exceptions included markets in South Korea, and Taiwan, which experienced an average growth rate of 12 percent.

Although the two largest export markets by dollar value remain the EC and Japan, both these markets experienced a significant decline in growth. Exports to Japan fell by over 20 percent in 1990. This decline can partly be attributed to a slowdown in capital expenditures by Japanese device producers, which were midstream between 1- and 4-megabit DRAM production. Export growth to Japan should improve in 1991 as production of 4- and 16- megabit DRAM production gets under way. Companies most likely to benefit from the new sales opportunities are those that already have a strong presence in the Japanese market and have the budget to continually upgrade their products and automate production to reduce overhead expenses.

South Korea was the fastest growing overseas market, with U.S. exports increasing from $91 million in 1989 to $104 million in 1990. Imports from South Korea remained flat at $19 million. This country's escalating demand for electronic test equipment mirrors its focus on developing high-technology industries. South Korea is now a major manufacturer of semiconductors, consumer electronics, and automobiles, products that all require a heavy investment in electrical test equipment.

Proximity to the end-user obviously provides a degree of competitive advantage. For this reason, many U.S. companies are establishing foreign sales and service centers in Japan, the EC, and other key markets. In addition, U.S. producers are following the Japanese lead by forging strong channels of communication with their customers. They are recognizing that higher product performance and reliable service typically provide a greater competitive advantage than a slight price differential.

Outlook for 1991

All of the industries that use electrical test equipment are hoping for strong sales growth in 1991. However, little improvement in the domestic economy is expected in the near term, and cuts in Federal spending will not only lead to a contraction of the defense market; it also will hurt sales of equipment used in university and government research labs.

Rapidly expanding markets in South Korea, Taiwan, and Malaysia will help to offset the weak domestic purchases in

Trends and Forecasts: Measuring and Controlling Devices (SIC 382)

(in millions of dollars except as noted)

Item	1987	1988[1]	1989[2]	1990[2]	1991[3]	Percent Change			
						1987-88	1988-89	1989-90	1990-91
Industry Data									
Value of shipments[4]	26,043	28,965	31,210	32,067	33,586	11.2	7.8	2.7	4.7
Value of shipments (1987$)	26,043	28,392	29,604	29,398	29,967	9.0	4.3	−0.7	1.9
Total employment (000)	285	294	304	303	—	3.2	3.4	−0.3	—
Production workers (000)	150	156	161	160	—	4.0	3.2	−0.6	—
Average hourly earnings ($)	10.62	10.82	—	—	—	1.9	—	—	—
Capital expenditures	903	891	—	—	—	−1.3	—	—	—
Product Data									
Value of shipments[5]	25,296	27,108	29,200	29,964	31,363	7.2	7.7	2.6	4.6
Value of shipments (1987$)	25,296	26,526	27,704	27,465	27,990	4.9	4.4	−0.9	1.9

[1] Advance data from the 1988 Annual Survey of Manufactures.

[2] Estimate.

[3] Forecast.

[4] Value of all products and services sold by establishments in the measuring and controlling devices industry.

[5] Value of products classified in the measuring and controlling devices industry produced by all industries.

SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA). Estimates and forecasts by ITA.

1991. Emerging markets in Eastern Europe also may generate new sales revenues, especially for companies that already have a strong presence in Western Europe.

Some revamping of device facilities throughout the world will boost sales of automatic test equipment. With the shift from 1-to 4-and 16-megabit DRAM production, sales should pick up for memory testers and automatic process monitors.

Long-Term Prospects

The long-term outlook is generally optimistic, with an average of 7 percent annual growth for the period 1991 to 1995. As electronic components become increasingly important to the functioning of all consumer and industrial goods, the market for test equipment should grow correspondingly.—*Sarah Cooper Hall, Office of Microelectronics and Ins mentation, (202) 377-2846, September 1990.*

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Photographic Equipment and Supplies

The value of photographic industry shipments is expected to remain at the $23.4 billion level in 1991, as gains in some product areas were offset by declines in others. In constant dollars, shipments declined about 2 percent.

Before reading this chapter, please see "How to Get the Most Out of this Book" on page 1. It will clarify questions you may have concerning data collection procedures, factors affecting trade data, forecasting methodology, the use of constant dollars, the difference between industry and product data, sources and references, and the Standard Industrial Classification system (SIC).

The wide range of applications for photographic products by end-users in the amateur, professional, and finishing markets, as well as in industrial and business markets, allows the U.S. photographic industry (SIC 3861) to adjust for periods of slow growth. As a result, demand for new products using the latest technologies and evolutionary product enhancements have boosted current market trends in some areas. For example, the market for single-use recyclable cameras has continued to expand due to the incorporation of additional features that make the cameras capable of performing in a variety of situations.

Advanced technology is being incorporated into camera circuitry to evaluate the focus and lighting conditions with increased accuracy and speed. Also, advances in both the standard silver halide film technology and newer and more technical electronic photography have helped to ensure continued growth and development of the industry.

Research on geographical photographic markets shows that the industry can continue to expand. In Europe, for example, only 55 to 80 percent of households in principal countries had cameras, compared with more than 90 percent in the United States.

Typically, diversity in the industry's products and markets results in a balancing in overall shipments. Photographic shipments showed only a slight increase in 1990, to $23.4 billion, after increasing 13 percent in 1989. The strong growth of the previous year was partially due to Japanese-owned plants in the United States starting to produce sensitized photographic paper and plates.

The increase in employment for these new operations was partly offset by attrition and cost-containment efforts by most domestic manufacturers. Industry employment declined 20 percent during the 1982-1986 period, but remained level from 1987 to 1989. The number of production workers declined at a faster rate of nearly 26 percent during the same period. Production workers, who represented 57 percent of total employment 10 years ago, accounted for about one-half the total in 1989. A modest downturn in total employment to about 87,000 workers was expected in 1990.

The $5 billion in materials used for the production of photographic equipment and supplies was about the same for the census years of 1982 and 1987. However, production costs do fluctuate. The producer price index for photographic equipment and supplies increased between 3 and 4 percent through midyear 1990. Silver recovery and recycling as a means of cost containment continues to be a priority for the industry. In addition, increased attention is being given to environmental issues and the reduction of solid waste.

Efforts by manufacturers to recycle paper packaging, plastic containers, and metal parts of photo supplies and equipment are expanding. In 1990, the industry launched

Trends and Forecasts: Photographic Equipment and Supplies (SIC 3861)

(in millions of dollars except as noted)

						Percent Change			
Item	1987	1988[1]	1989[2]	1990[2]	1991[3]	1987-88	1988-89	1989-90	1990-91
Industry Data									
Value of shipments[4]	19,241	20,649	23,300	23,400	23,400	7.3	12.8	0.4	0.0
Value of shipments (1987$)	19,241	20,434	22,212	21,667	21,273	6.2	8.7	−2.5	−1.8
Total employment (000)	88.0	88.0	88.0	87.0	87.0	0.0	0.0	−1.1	0.0
Production workers (000)	44.8	44.1	44.0	43.5	43.5	−1.6	−0.2	−1.1	0.0
Average hourly earnings ($)	13.29	13.12	13.20	13.60	—	−1.3	0.6	3.0	—
Capital expenditures	681	812	—	—	—	19.2	—	—	—
Product Data									
Value of shipments[5]	15,324	16,662	18,875	18,950	18,950	8.7	13.3	0.4	0.0
Value of shipments (1987$)	15,324	16,454	17,874	17,546	17,227	7.4	8.6	−1.8	−1.8

[1] Advance data from the 1988 Annual Survey of Manufactures.

[2] Estimate.

[3] Forecast.

[4] Value of all products and services sold by establishments in the photographic equipment and supplies industry.

[5] Value of products classified in the photographic equipment and supplies industry produced by all industries.

SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA). Estimates and forecasts by ITA.

programs to recycle parts of the single-use camera. As its name implies, the single-use camera is used once by the consumer, who returns it to the film processor with the exposed film inside. The major components are recycled into a new camera with fresh film.

Camera pricing was a major issue for the industry in 1990, as typified in the case of a domestic manufacturer who filed a petition with the U.S. International Trade Commission (USITC) for import relief in the form of tariffs and quotas. The petitioner argued that the industry was injured by the large volume of low-priced imports of certain 35mm and 110-types of cameras, primarily from some Pacific Rim countries.

The petition was opposed by many U.S. camera manufacturers, retailers, and interest groups that felt intervention in the trade and competition of the U.S. camera industry would be detrimental to the entire photographic industry, including the U.S. photofinishing business. The USITC determined that the petitioner did not meet the statutory criteria for import relief under Section 201 of the Trade Act.

INTERNATIONAL COMPETITIVENESS

The U.S. photographic market is the largest in the world. Foreign competition dominates some product areas, such as 35mm single-lens reflex (SLR) cameras, low-end copiers, and minilab photofinishing equipment. In other areas--such as sensitized film, paper and plates, and instant cameras and film—U.S. firms successfully compete in established as well as developing markets.

U.S. Exports and Imports
Photographic Equipment and Supplies
(in millions of dollars except as noted)

SIC	Industry	1989	1990[1]	1991[2]	Percent Change 1989-90	Percent Change 1990-91
3861	Photographic equipment and supplies					
	Value of exports	3,047	3,300	3,500	8.3	6.1
	Value of imports	5,550	5,500	5,500	−0.9	0.0

[1] Estimate. [2] Forecast.

SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA). Estimates and forecasts by ITA.

Economic and political factors can determine where products are manufactured and marketed. For example, the recent history of the strong yen caused many Japanese firms to establish camera and film manufacturing subsidiaries outside of Japan. Political decisions by the European Community and some developing countries also affect the make-up of world production and patterns of trade.

U.S. photographic product exports increased 8 percent to $3.3 billion in 1990. Although photographic chemicals accounted for only 6 percent of the total exports, this category showed the strongest growth rate, rising 15 percent to $220 million. Photocopier and micrographic equipment rose 13 percent to about $750 million. Copiers using electrostatic technology accounted for over 60 percent of the 75,000 units shipped.

Sensitized film, paper, and plates, which represent close to one-half of the export total, rose 11 percent to $1.6 billion. Motion picture equipment exports declined from 1989 and still-picture equipment remained at about the same level.

U.S. imports of photographic equipment and supplies dipped 1 percent in 1990 to $5.5 billion, after increasing 7 percent the previous year. The decline in the import value was led by a fall-off in still-picture equipment and photocopiers, both down about 4 percent, to $1.4 billion and $2.2 billion, respectively. Causes for this first-time decline in photographic imports include the start-up by several foreign firms of U.S.-based manufacturing of sensitized materials and copiers and the displacement of more expensive imported camera equipment by less expensive, compact models.

U.S. Trade Patterns in 1989
Photographic Equipment and Supplies
SIC 3861
(in millions of dollars, percent)

Exports	Value	Share	Imports	Value	Sh
Canada & Mexico	480	15.8	Canada & Mexico	303	
South America	161	5.3	South America	101	
European Community	1,099	36.1	European Community	888	1
East Asia NICs	228	7.5	East Asia NICs	417	
Japan	512	16.8	Japan	3,544	63
Other	566	18.6	Other	297	5
World Total	3,047	100.0	World Total	5,551	100

Top Five Countries

	Value	Share		Value	Sha
Japan	512	16.8	Japan	3,544	63.
United Kingdom	403	13.2	Netherlands	308	5.
Netherlands	359	11.8	Canada	220	4.
Canada	340	11.2	United Kingdom	215	3.
France	278	9.1	West Germany	183	3.

See "How to Get the Most Out of This Book" for definitions of the Country Groupings.

SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA).

Japan continues to be the major supplier of photographic products to the United States, with a 64 percent import share. This percentage, which once averaged 70 percent, has declined since many Japanese owned manufacturing facilities are in other locations, such as China, Malaysia, and Hong Kong. Imports worth $1.2 billion from Western Europe accounted for about 22 percent of the U.S. import total. The Latin American region sent 3 percent, or about $140 million.

Outlook for 1991

Some growth will likely occur among the range of products manufactured by the U.S. photographic industry. However, little change is expected in the overall value of shipments because any gains will compensate for declines in other product areas. As a result, industry shipments are expected to remain at the $23.4 billion level in 1991. In constant dollars, shipments are expected to decline about 2 percent.

Manufacturers will continue to restrain operating costs and employment during the year. The moderate growth in photographic exports and the expected tapering off in imports should reduce the trade deficit by 9 percent to $2 billion. The U.S. market for photographic products should remain healthy, but the uncertainty concerning the economy and spending will hold sales down, especially in the amateur segment.

Consumer Photography

The recent trend in 35mm camera growth continues. This category dominates the still-camera segment, accounting for more than 60 percent of U.S. camera sales in 1990. Most of the growth is occurring in the non-SLR category, particu-

Automatic equipment assembles the electronic circuitry used in advanced photographic products. In 1991, moderate growth in U.S. exports of photographic equipment and supplies, and expected reductions in imports should reduce the industry's trade deficit by 9 percent to $2 billion.

larly with less costly lens shutter (LS) cameras. U.S. camera shipments for 35mm LS cameras increased 28 percent in 1989 to 10 million units, according to *The Wolfman Report on the Photographic and Imaging Industry* (Figure 1). The array of automatic features on virtually all models translates into ease of use, a major selling point. In addition, new features like zoom lenses, automatic focusing, voice activation, and remote control continue to entice buyers.

With nearly 200 lens shutter models available, virtually all consumer needs for both options and price can be met. Low-end models are an alternative to 110-type cartridge film and disc film cameras, while high-end compacts often compete with 35mm SLR cameras. SLR cameras accounted for about 6 percent of the volume shipments in 1989 and represented about 25 percent of the value. The yearly double-digit decline in SLR sales which began in the mid-1980s is slowing as some photographers upgrade their skills and equipment. Industry sources estimated that sales of 35mm SLRs would drop to about 1 million units in 1990, with autofocus models accounting for 75 percent of the total. Sales continue to suffer due to the selection of fully featured compact 35mm cameras and consumer video products, like camcorders, which both have had strong sales in recent years. Imports of 35mm SLR cameras declined about 6 percent to 1.6 million units in 1990.

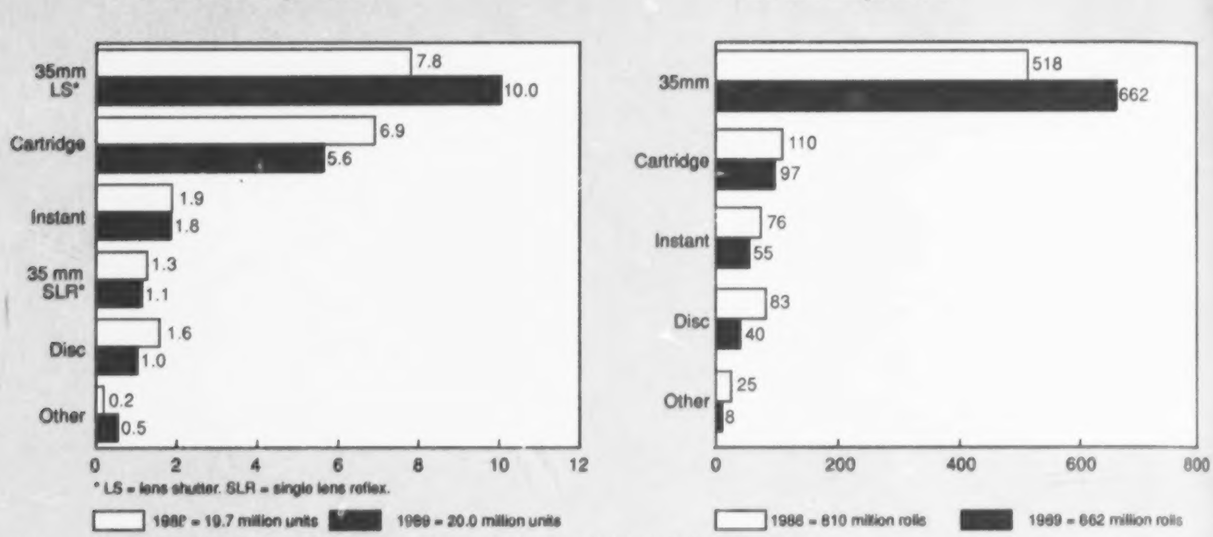
Cartridge camera shipments declined over 1 million units in 1989. However, this format still accounts for over a quarter of the U.S. still-camera sales. Manufacturers continue to support demand, especially from teenagers and senior citizens. Changes in design and colors and the distribution of 110-type cameras as novelty items in promotional campaigns help sustain sales for this format.

Sales of instant cameras peaked in 1978 and have declined each year since then. Sales continued sluggish in 1989, declining 5 percent. In efforts to revive this sector, U.S. manufacturers are investigating possibilities for joint ventures and expansion into untapped markets in Asia and the Soviet Union. Also, the emphasis on creating and marketing new products will appeal to medical and industrial markets that continue to find new uses for instant photographic products.

In the five-year period since the introduction of single-use cameras, five suppliers have expanded their offerings to include a variety of models. In Japan, industry reports indicated that single-use (or film-with-a-lens) cameras have established a firm market. Japanese Government statistics reported about 25 million units sold in 1989 and estimated figures for 1990 were up 30 percent. This emerging market is growing at a slower rate in the United States than in Japan. Sources estimate the U.S. market for single-use cameras to be about 20 percent of the Japanese market.

Single-use cameras are often used as substitutes for more expensive cameras, such as specialized wide-angle or underwater cameras, but are also used as upgrade replace-

Figure 25-1



U.S. Camera Shipments

U.S. Film Shipments

* LS = lens shutter. SLR = single lens reflex.

Source: *The 1989-90 Wolfman Report on the Photographic and Imaging Industry in the United States.*

ments for the low-cost 110-type cartridge cameras. Use of the 35mm single-use camera by 110-type camera users gives them an opportunity to experiment with the 35mm-format and could encourage them to shift away from the 110-format due to the better picture quality of 35mm film.

Electronic still cameras transfer images to a 2-inch magnetic disk similar to a computer disk. No processing is necessary. One advantage of electronic photography is that images can be transmitted electronically. Electronic still photography is currently being used in commercial applications for newspapers and in publishing, while experimentation with new applications continues in other industries where quick image processing is important.

The consumer segment of the market is still reluctant to accept electronic still cameras due to their high costs and lack of useful consumer applications. Among its limitations, electronic photography does not produce the sharp detail that customers have come to expect from silver halide film used with 35mm cameras.

The introduction of electronic still photography has not stifled the use or growth of silver halide sensitized products. In fact, manufacturers continue to make improvements in color resolution, sharpness, grain, and speed. U.S. film sales increased 6 percent to 862 million rolls in 1989, according to *The Wolfman Report* (Figure 1). Nearly 77 percent of these sales were attributed to the 35mm type.

A quarterly survey of nearly 14,000 U.S. households, conducted by the Photo Marketing Association International, revealed that nearly 52 percent of the households had bought about 5 rolls of film during the first three months of 1990. Households with children bought more film than those without children. A gradual decline in purchases occurred for the various age groups, from 81 percent for households with children age 2 and under, to 51 percent for those without children.

On a regional basis, 35mm film consistently held about 70 percent of the market in all areas of the nation. Sales of 35mm slide film were stronger on the East and West coasts. Purchases of instant film were fairly consistent in all areas, while cartridge and disc film purchases were heavier in the Central and Southeastern states.

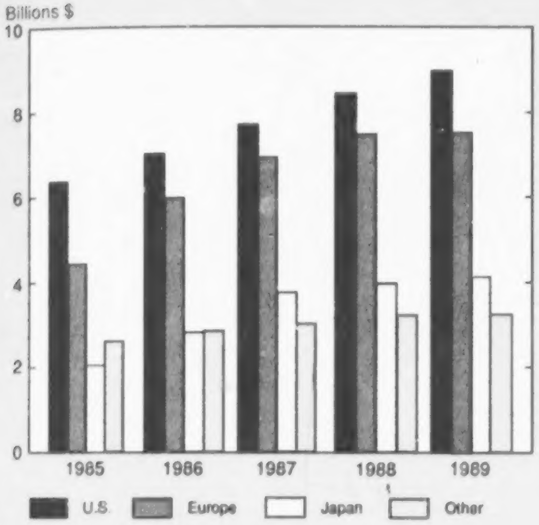
A steady increase in film sales and exposures also brings on an increased use of sensitized color photographic paper. Amateur photographers provide the largest market share to the photofinishing segment since a large majority of their exposures are processed as color prints.

The United States accounts for the largest share of worldwide still picture exposures. The nearly 21 billion exposures in the U.S. market represented 38 percent of the worldwide total in 1989. Europe and Japan together accounted for another 43 percent of the exposures, leaving 19 percent for the rest of the world.

A similar breakdown occurs for the worldwide photofinishing markets. According to *Photofinishing News, Inc.*, the U.S. retail market for photofinishing (SIC 7384) increased 7 percent to $9 billion in 1989, approximately 39 percent of the $24 billion worldwide total (Figure 2). The U.S. amateur segment which accounts for close to 60 percent of the total, increased 4 percent. Over three-fourths of the amateur film processed was 35mm.

The U.S. professional segment—which includes revenues from portrait photography, commercial, and custom labs—showed a faster growth of 10 percent and contributed $3.8 billion to the overall 1989 total. In the other world regions, Europe accounted for $7.6 billion, or 32 percent; Japan, $4.1

Figure 25-2
Worldwide Photofinishing Market



Source: *Photofinishing News, Inc.*

billion, or 17 percent; and the rest of the world, $3.2 billion, or 13 percent. The professional segment in these regions accounted for 20 percent or less of the photofinishing total.

Photocopiers

Domestic copier production represents about 25 percent of the total photographic industry shipments. The low-end of the U.S. copier market continues to be dominated by imports, although several Japanese manufacturers are producing some models domestically. The Computer and Business Equipment Manufacturers Association (CBEMA) projected that low-speed copiers—up to 24 copies per minute (CPM)—represented about 60 percent of the 1.4 million in U.S. plain paper copier unit shipments for 1990.

Manufacturers continue to make improvements to existing copier features, like paper feeders and sorters and diagnostics capabilities, but also are committed to the development of new products and combination products such as copier/printers. Meanwhile, the market for color copiers, where demand has lagged the expectations of many industry observers, is showing some gains. The high costs and limited applications of these products have held sales down.

While many offices are equipped with color display monitors, the lack of color printers and the inability of most color copiers to interface with the computer to serve as an output device in office environments makes it difficult to transfer color images onto paper. BIS/CAP International, a research firm, estimated 1990 placement of color copiers would reach 6,670 units from the 12 companies currently supplying models. At the high-end of the copier market, Japanese manufacturers continue to put pressure on domestic manufacturers with the introduction of new models with speeds of 70 CPM or more.

Long-Term Prospects

The U.S. photographic industry should experience periods of growth among the diverse product offerings. In addition, the integration of traditional photographic and electronic imaging technologies will offer opportunities for expansion. With the expansions and contractions over the next five years, industry shipments are projected to decline in constant dollars by 3 to 5 percent. After 1992, the combined European photographic market will be larger than the U.S. market, and opportunities to expand the worldwide industry will exist. As a result, the location of production facilities and patterns of trade will shift to meet new requirements.

Competition among suppliers of sensitized film and paper should intensify as firms continue to make improvements in technology and quality. Foreign firms producing silver halide materials in the United States will increase efforts to strengthen their market position. Demand for these products should continue to increase at moderate rates in both the consumer and commercial segments.

Meanwhile, consumer interest in 35mm photography should continue, and moderate growth should be expected in the photofinishing area as well. Services of many minilabs will broaden to incorporate electronic imaging services like still video prints, image transfer, and color copying. Demand for electronic still cameras by the consumer segment will be limited. High prices and the lack of useful applications will suppress growth, especially since leisure spending will be devoted to alternative consumer electronic products. Electronic still photography should gain some ground in professional markets as users continue to experiment with new applications.

Manufacturers of digital and full-color copiers will attempt to establish a foothold in the office environment and in photographic/graphic service areas. These machines could also be a key component in the development of multifunctional machines that combine copying, printing, and facsimile.—*Joyce Watson, Office of Computers and Business Equipment, (202) 377-0574, September 1990.*

Additional References

(Call the Bureau of the Census at (301) 763-4100 for information about how to order Census documents.)

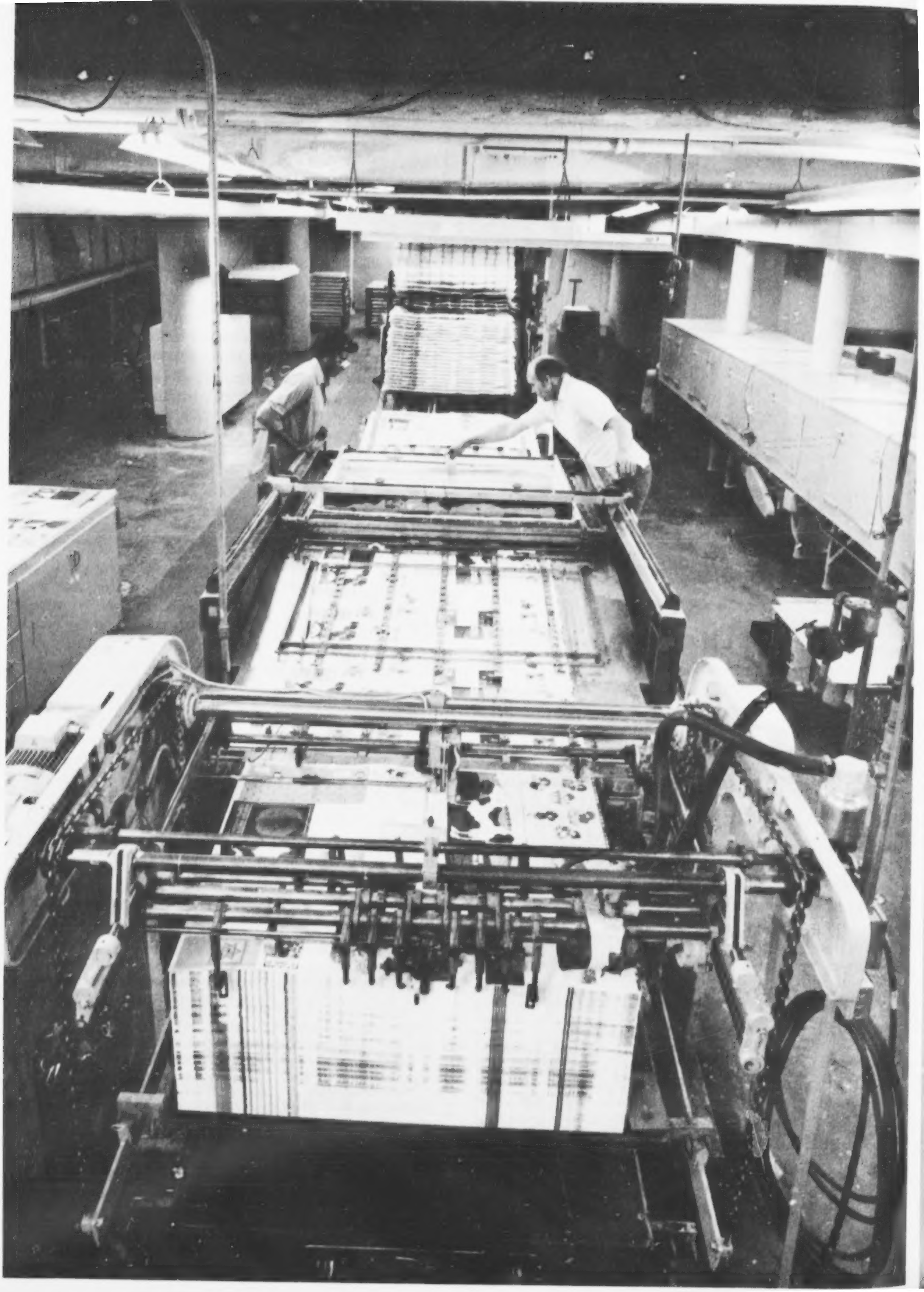
1987 Census of Manufacturers, (MC87-1-38B), Bureau of the Census, U.S. Department of Commerce, Washington, D.C. 20233. Telephone: (301) 763-7304.

The 1989-90 Wolfman Report on the Photographic and Imaging Industry in the United States, Popular Photography Magazine, Diamandis Communications, Inc., 1633 Broadway, New York, NY 10019. Telephone: (212) 767-6048.

The 1990 Photo Processing Industry Report, Photofinishing News, Inc. 4100 Corporate Square, Naples, FL 33941. Telephone: (813) 643-5666.

Photo Marketing Magazine, Photo Marketing Association International, 3000 Picture Place, Jackson, MI 49201. Telephone: (517) 788-8100.

The Information Technology Industry Data Book 1960-2000 Computer and Business Equipment Manufacturers Association (CBEMA), 311 First Street, N.W., Suite 500, Washington, D.C. 20001. Telephone: (202) 737-8888.



26

Printing and Publishing

Growth in school enrollments, disposable personal income, business activity and advertising expenditures should lift shipments of the U.S. printing and publishing industry (SIC 27) to $172 billion in 1991, 2.1 percent—in constant dollars—over 1990.

Before reading this chapter, please see "How to Get the Most Out of This Book" on page 1. It will clarify questions you may have concerning data collection procedures, factors affecting trade data, forecasting methodology, the use of constant dollars, the difference between industry and product data, sources and references, and the Standard Industrial Classification system (SIC). For other topics related to this chapter, see chapter 27 (Information Services).

Firms engaged in the manufacture of printed products represent one of the nation's oldest and largest industries. With approximately 60,000-65,000 establishments and 1.55 million employees, the industry's range of products extends from books to brochures, cards to catalogs, menus to magazines, and note pads to newspapers. Printing and publishing is the home of small business, with only 20 percent of all establishments having 20 or more employees. The entrepreneurial focus of most firms is to serve local and regional markets, but some printers—and many publishers—reach national and international markets.

The printing and publishing industry enters the 1990s accompanied by generally positive demographic factors. From 1990 to 1995, 3.0 million new students will enroll in U.S. elementary schools, high schools and colleges, 6.1 million new U.S. households will form, and the U.S. population will expand by 9.7 million persons. Growth of these sectors should enlarge the U.S. market for virtually all printed products. Negative factors include a stubbornly high rate of illiteracy, an apparent contraction of leisure time and greater competition for the U.S. consumer's attention by the non-print media.

Other factors influencing demand for printed products include business formations, the level of U.S. business activity, expenditures for advertising and economic developments of a product-specific nature. For example, the sharp decline of debt/equity offerings since the stock market collapse of

Trends and Forecasts: Printing and Publishing (SIC 27)

(in millions of dollars except as noted)

Item	1987	1988[1]	1989[2]	1990[2]	1991[3]	Percent Change 1987-88	1988-89	1989-90	1990-91
Industry Data									
Value of shipments[4]	136,105	143,815	153,717	161,543	171,852	5.7	6.9	5.1	6.[illegible]
2711 Newspapers	31,849	33,044	34,312	35,101	36,611	3.8	3.8	2.3	4.3
2721 Periodicals	17,329	18,914	20,625	21,691	23,382	9.1	9.0	5.2	7.8
2731 Book publishing	12,620	13,574	14,930	15,975	17,250	7.6	10.0	7.0	8.0
2732 Book printing	3,256	3,781	4,235	4,510	4,895	16.1	12.0	6.5	8.5
2741 Misc publishing	7,810	6,968	7,490	8,015	8,650	-10.8	7.5	7.0	7.9
275 Commercial printing	44,731	47,955	51,715	55,075	58,930	7.2	7.8	6.5	7.0
2761 Manifold business forms	7,359	7,761	7,932	8,011	8,107	5.5	2.2	1.0	1.2
2771 Greeting cards	2,911	3,082	3,255	3,499	3,744	5.9	5.6	7.5	7.0
2782 Blankbooks & binders	2,905	3,041	3,240	3,425	3,680	4.7	6.5	5.7	7.4
2789 Bookbinding	1,175	1,218	1,245	1,285	1,320	3.7	2.2	3.2	2.7
2791 Typesetting	1,784	1,920	2,035	2,131	2,274	7.6	6.0	4.7	6.7
2796 Platemaking services	2,376	2,557	2,703	2,825	3,009	7.6	5.7	4.5	6.5
Value of shipments (1987$)	136,105	137,050	139,871	141,292	144,301	0.7	2.1	1.0	2.1
2711 Newspapers	31,849	30,965	30,338	29,497	29,312	-2.8	-2.0	-2.8	-0.6
2721 Periodicals	17,329	17,885	18,350	18,258	18,587	3.2	2.6	-0.5	1.8
2731 Book publishing	12,620	12,856	13,396	13,731	14,143	1.9	4.2	2.5	3.0
2732 Book printing	3,256	3,679	3,770	3,875	3,970	13.0	2.5	2.8	2.5
2741 Misc publishing	7,810	6,589	6,835	7,035	7,275	-15.6	3.7	3.0	3.4
275 Commercial printing	44,731	46,478	48,105	49,550	51,285	3.9	3.5	3.0	3.5
2761 Manifold business forms	7,359	7,232	7,406	7,418	7,431	-1.7	2.4	0.2	0.2
2771 Greeting cards	2,911	2,922	2,986	3,027	3,056	0.4	2.2	1.4	1.0
2782 Blankbooks & binders	2,905	2,898	2,959	3,015	3,110	-0.2	2.1	1.9	3.2
2789 Bookbinding	1,175	1,180	1,170	1,150	1,160	0.4	-0.8	-1.7	0.9
2791 Typesetting	1,784	1,866	1,942	2,012	2,106	4.6	4.1	3.6	4.7
2796 Platemaking services	2,376	2,500	2,614	2,724	2,866	5.2	4.6	4.2	5.2

[1] Advance data from the 1988 Annual Survey of Manufactures.

[2] Estimate.

[3] Forecast.

[4] Value of all products and services sold by establishments in the printing and publishing industry.

SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA). Estimates and forecasts by ITA.

October 1987 has forced several large financial printers to merge, consolidate or close. But the dominant demand factor is advertising, with revenues from this source representing upwards of 60 percent of total U.S. printing and publishing shipments.

Through the 1980s, shares of total U.S. advertising expenditures held by newspapers and magazines declined, but advertising by direct mail, yellow pages, shoppers, coupons, free-standing inserts and catalogs increased. Beginning in the late 1980s, traditional print and broadcast media—newspapers, magazines, radio, television—faced a changing advertising environment, where advertisers' focus was less on product image or brand awareness and more on expenditures of a promotional nature: store incentives, point-of-purchase displays, and premiums. A continuation of this ad expenditure trend in the 1990s could place newspapers and magazines at a slight disadvantage vis-a-vis the more promotion-oriented print media listed above.

Printers and publishers will face higher operational costs as the 1990s progress. Postal rate increases ranging from 15 to 30 percent will be phased in, beginning in the Spring of 1991, potentially dampening demand for magazine, catalog and direct mail printing. After experiencing a decade of only moderate gains in wages, printing firms are bidding up the cost of labor in response to a growing scarcity of skilled production workers. The industry's annual outlay for capital expenditures exceeds $6 billion and has effectively substituted capital for labor: the number of production workers as a percent of total industry employment declined to an estimated 53 percent in 1990 from 61 percent in 1965. Printing and publishing's paper costs, which account for 60 percent of the industry's total material costs, could increase significantly in the early 1990s if legislation mandating use of recycled paper prompts an initial scarcity of this item.

U.S. Exports and Imports
Printing and Publishing

(in millions of dollars except as noted)

SIC	Industry	1989	1990[1]	1991[2]	Percent Change 1989-90	Percent Change 1990-91
2711	Newspapers					
	Value of exports	28.6	35.8	41.2	25.2	15.1
	Value of imports	96.1	64.1	70.5	−33.3	10.0
2721	Periodicals					
	Value of exports	578	693	892	19.9	28.7
	Value of imports	140	148	162	5.7	9.5
2731	Book publishing					
	Value of exports	1,288	1,450	1,650	12.6	13.8
	Value of imports	800	880	1,000	10.0	13.6
2732	Book printing					
	Value of exports	77.8	—	—	—	—
	Value of imports	0.0	—	—	—	—
2741	Miscellaneous publishing					
	Value of exports	21.7	—	—	—	—
	Value of imports	25.3	—	—	—	—
275	Commercial Printing					
	Value of exports	891	715	785	−19.8	9.8
	Value of imports	445	465	500	4.5	7.5
2761	Manifold business forms					
	Value of exports	5.3	—	—	—	—
	Value of imports	1.7	—	—	—	—
2771	Greeting cards					
	Value of exports	31.3	—	—	—	—
	Value of imports	27.4	—	—	—	—
2782	Blankbooks and looseleaf binders					
	Value of exports	19.7	—	—	—	—
	Value of imports	203	—	—	—	—
2789	Bookbinding and related work					
	Value of exports	7.7	—	—	—	—
	Value of imports	12.3	—	—	—	—
2791	Typesetting					
	Value of exports	0.0	—	—	—	—
	Value of imports	0.6	—	—	—	—
2796	Platemaking services					
	Value of exports	38.6	—	—	—	—
	Value of imports	22.6	—	—	—	—
	PRINTING AND PUBLISHING					
	Value of exports	3,688	—	—	—	—
	Value of imports	1,774	—	—	—	—

[1] Estimate.

[2] Forecast.

SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA). Estimates and forecasts by ITA.

Printed products face growing competition from the electronic media, as traditional customers of print seek knowledge and information in new formats. This trend has often created new markets for U.S. publishers, but represents lost revenues to U.S. printers. Examples are the development of audio books for primary use in car audio cassette systems; encyclopedias in laserdisk formats for classroom use; directories and other reference works in CD-ROM formats for libraries and institutions; training and technical manuals on videocassettes; and newsletters delivered through the electronic bulletin boards of personal computers.

Foreign markets for U.S. printed products grew rapidly in the 1980s, a trend that should continue well into the 1990s. Exports of the U.S. printing and publishing industry reached an estimated $3.8 billion in 1990, with books and magazines representing one-half of this volume. Major purchasers of these goods are Canada, the United Kingdom, Australia and Japan, but significant sales are made to other European and Pacific Rim countries.

The U.S. Government has taken a number of steps in support of international trade. Negotiations at the Uruguay Round of the General Agreement on Tariffs and Trade (GATT) continued the removal of tariff and nontariff barriers to U.S. printed products and laid the framework for stronger international copyright protection. The Free

U.S. Trade Patterns in 1989
Printing and Publishing

SIC 27

(in millions of dollars, percent)

Exports	Value	Share	Imports	Value	Share
Canada & Mexico	1,708	48.0	Canada & Mexico	425	24.0
South America	96	2.7	South America	20	1.1
European Community	594	16.7	European Community	497	28.0
East Asia NICs	146	4.1	East Asia NICs	408	23.0
Japan	302	8.5	Japan	231	13.0
Other	771	20.0	Other	193	10.9
World Total	3,557	100.0	World Total	1,774	100.0
Top Five Countries					
	Value	Share		Value	Share
Canada	1,420	39.9	Canada	407	22.9
United Kingdom	300	8.4	United Kingdom	293	16.5
Japan	265	7.4	Japan	231	13.0
Australia	174	4.9	Hong Kong	174	9.8
West Germany	90	2.5	Italy	96	5.4

See "How to Get the Most Out of This Book" for definitions of the Country Groupings.

SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA).

Trade Agreement (FTA) between Canada and the United States is phasing out high Canadian tariffs on U.S. catalogs and trade advertising materials. FTA discussions between Mexico and the United States are scheduled for 1991.

The 1980s were characterized by substantial foreign investment in the U.S. printing and publishing industry. But as the 1990s unfold, a role reversal could occur, with many U.S. firms seeking investment opportunities abroad, particularly in the EC and Eastern European countries. Growth of English as the world's second language, and international interest in the technical, scientific and cultural aspects of the U.S. experience should enhance the increasingly global position of the nation's printers and publishers.—*William S. Lofquist, Office of Consumer Goods, (202) 377-0379, September 1990.*

NEWSPAPERS

Following a year of little growth in 1989, newspaper industry receipts declined nearly 3 percent in 1990, in constant dollars. Newspapers were a casualty of slow growth in spending for U.S. advertising, and in the overall economy. Retail ad spending in newspapers was soft and classified ad spending dropped sharply. For a third year, the growth rate for ad spending in newspapers was lower than the rates for total U.S. advertising expenditures and GNP. Daily newspaper circulation remained flat, but Sunday circulation showed a small gain. Weeklies recorded strong circulation growth.

Advertising

Early in 1990, newspaper industry analysts expected another slow year for ad spending in newspapers, but the outcome was bleaker than anticipated. Although projected to grow 4 to 5 percent, newspaper ad spending was up about 1 percent. The newspaper industry's local sources of ad revenues were hit hardest.

According to the Newspaper Advertising Bureau, retail ad spending was expected to grow 2 to 3 percent to about $17.3 billion, resulting in a decline in retail ad linage. The low growth rate in retailers' ad expenditures reflected soft retail sales, financial instability, and further consolidation among large retail chains. The worst blow for newspapers was an expected 4 to 5 percent drop in classified ad spending which totaled about $11.7 billion in 1990.

While newspaper classified ad spending grew at a faster rate than other newspaper ad spending during the 1980s, it suffered its greatest loss in 20 years in 1990. The impact of the economic slowdown on local business hurt help-wanted, real estate and automotive advertising in newspapers. National advertisers' spending in newspapers was expected to increase 5 to 6 percent to about $10.5 billion in 1990, in line with total U.S. media spending.

Over the past decade, a sizable shift has occurred in the local ad spending categories for newspapers, making them more vulnerable to economic downturns. In 1980, retail advertising accounted for 58 percent of total newspaper ad spending; by 1988 it represented 51 percent. Classified ads which represented 29 percent of the total in 1980 had a 38 percent share in 1988, while national advertising's share dropped from 13 to 11 percent. Although daily newspapers had a near monopoly on classified advertising during much of the 1980s, weekly newspapers and free real estate, auto trader and employment publications are cashing in on this profitable market.

Although about 80 percent of newspaper revenues still come from advertising, competitors from other media continue to make inroads into the industry's market share of total U.S. ad spending. Newspapers face stiff competition from cable, local and network television, direct mail, radio, magazines, shopping news, Yellow Pages and phone companies. Although newspapers still attract the largest share of total U.S. advertising spending, their share continued to decline in 1990 to 25.4 percent, down from 27.6 percent in 1980.

Circulation

Circulation for many large daily papers rose early in 1990, but over the year total circulation growth for all U.S. dailies was expected to be nearly flat. Sunday circulation was estimated to rise 1 to 2 percent. Daily and Sunday circulation figures were expected to total nearly 63 million. An Audit Bureau of Circulation report on newspaper circulation from March 1989 to March 1990 reveals that the majority of the largest U.S. daily newspapers (100,000 circulation or more) increased both their weekday and Sunday circulation. But unfortunately for many newspapers, circulation continued to experience declining household penetration. Although the household penetration ratio for daily newspapers in 1980 was 77 percent, by 1989, it dropped to 67 percent. For Sunday

Trends and Forecasts: Newspapers (SIC 2711)

(in millions of dollars except as noted)

Item	1987	1988[1]	1989[2]	1990[2]	1991[3]	Percent Change 1987-88	1988-89	1989-90	1990-91
Industry Data									
Value of shipments[4]	31,849	33,044	34,312	35,101	36,611	3.8	3.8	2.3	4.3
Value of shipments (1987$)	31,849	30,965	30,338	29,497	29,312	−2.8	−2.0	−2.8	−0.6
Total employment (000)	435	433	434	436	436	−0.5	0.2	0.5	0.0
Production workers (000)	149	147	145	145	146	−1.3	−1.4	0.0	0.7
Average hourly earnings ($)	11.37	11.35	11.70	11.93	—	−0.2	3.1	2.0	—
Capital expenditures	1,523	1,632	—	—	—	7.2	—	—	—
Product Data									
Value of shipments[5]	30,494	31,504	32,827	33,451	34,889	3.3	4.2	1.9	4.3
Value of shipments (1987$)	30,494	29,528	29,025	28,110	27,934	−3.2	−1.7	−3.2	−0.6

[1] Advance data from the 1988 Annual Survey of Manufactures.

[2] Estimate.

[3] Forecast.

[4] Value of all products and services sold by establishments in the newspapers industry.

[5] Value of products classified in the newspapers industry produced by all industries.

SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA). Estimates and forecasts by ITA.

National Newspaper Association

Increasingly, weekly newspapers are cashing in on the profitable market of classified advertising.

papers, the ratio was nearly unchanged at 68 percent in 1980 and 67 percent in 1989.

Daily newspapers totaled 1,626 in 1989 with 1,125 P.M. and 530 A.M. papers. According to the American Newspaper Publishers Association, 45 new dailies were started, while 25 others stopped daily publication. Most of those ceasing publication merged with other papers or converted to weekly publication. Among dailies, the trend from P.M. to A.M. continued with at least nine morning papers going to an afternoon schedule.

Newspaper publishers are generally reluctant to pass on their costs by raising newspaper prices, even when advertising growth slows, since they wish to maintain their readership levels. Still, an increasing number of papers raised their single-copy price to 35 cents over the past several years. In 1989, 688 papers sold at 35 cents, up from 533 in 1988; 786 papers were priced at 25 cents, down from 885 in 1988.

Weeklies declined by 56 papers in 1990 to 7,550; many losses occurred through mergers. Nevertheless, weekly newspapers maintained a strong position in 1990, with total weekly circulation rising about 4 percent to over 55 million. Weeklies' ability to attract readers by focusing on local news coverage has made them formidable competitors for daily papers in a growing number of metropolitan areas.

Concentration and Acquisitions

Concentration of ownership in the newspaper industry continued to edge upward in 1990. Chain-owned newspapers represented 82 percent of total daily newspaper circulation and 76 percent of total daily papers. While acquisitions and merger of daily newspapers were up in 1990, weeklies continued to be the focus of attention in transactions. Weeklies have become attractive buys as the number of dailies for sale have decreased. Also, escalating selling prices for dailies and the increasing profitability of weeklies have attracted prospective buyers.

Although U.S. newspaper publishers have kept most of their operations within U.S. boundaries, foreign publishers have made significant inroads into U.S. newspaper publishing. Over 10 percent of U.S. dailies are owned by foreign companies, mostly by Canadian publishers.

Financial Situation

According to Morton Research, a newspaper investment analysis firm, 1990 half-year earnings of publicly-owned newspaper companies were down nearly 15 percent, making 1990 one of the worst earning years for newspapers. Newspapers have generally fared better during recessionary periods.

Capital expenditures were expected to be about $1.2 billion in 1990, down from $1.5 billion in 1989. For the past two years, newspapers have reported declining capital expenditure figures for the first time since 1983.

Outlook for 1991

The health of the newspaper industry in 1991 will be closely tied to the U.S. economy. If there is some upward movement in business activity, newspapers should benefit, especially in their classified and retail advertising sectors. But continued sluggishness in employment, real estate and auto sales—coupled with soft retail sales and competition from other media—could mean a second year of exceptionally slow growth in newspaper advertising receipts. Little change is expected in daily circulation growth for newspapers in 1990. Real disposable personal income is expected to rise only slightly, thus limiting discretionary spending for consumers. Moreover, other information and entertainment sources will compete intensely with newspapers for consumers' limited leisure time.

Newspaper costs are not expected to increase more than 5 percent in 1991, with the exception of postal costs. Higher postal rates, averaging 26 percent for newspapers, are scheduled to become effective as early as February 1991.

With little growth in the economy, newspaper industry receipts are projected to decline 0.6 percent in constant dollars in 1991. If growth in GNP is moderate, newspaper receipts could rise, but likely less than 1 percent.

Long-Term Prospects

During the next 5 years, newspaper industry receipts should rise at an average annual rate of 1.0–1.5 percent in constant dollars, since real GNP is forecast to grow moderately. The growth rate for newspapers likely will trail the rate for the total printing and publishing industries sector.

The decade of the 1990s is expected to be the most challenging to date for the newspaper industry. Faced with aggressive competition from other media, telecommunication, and entertainment sources, newspapers will need to mount stronger customer-service and marketing programs to retain or increase their advertising and circulation bases. While newspapers will have to maintain their mass media appeal, it will become vital for them to provide more personalized services and even greater target marketing for diverse reader and advertising groups. By focusing on specific reader segments, newspapers are likely to benefit from increased ad linage as well, since advertisers want to reach these more defined audiences.

To capture new readers and retain existing ones, newspapers will develop editorial content of greater interest to readers. Newspapers will be challenged to meet the diverse information needs of young and old, the affluent, working women, minorities and other population segments. They will need to develop more special newspaper sections and features that have greater appeal and relevance to the lifestyles of these diverse groups.

Aging baby boomers and an expected decline in the rate of household growth could boost household penetration for newspapers in the 1990s. However, newspapers cannot count on these factors alone to boost penetration since the competition for the public's time and attention will grow. According to media analysts, this competition will intensify as new developments in television, personal computers, and telephone-based information services occur over the next several years.

Industry analysts predict that, during the 1990s, competition for advertising revenues will be tougher than in the 1980s. Although newspapers' major competitors will still be television, cable, radio, direct mail, Yellow Pages and magazines, these will be joined by other media and new types of selling. Newspapers are facing increased pressure to position themselves in the electronic information business or risk erosion of their market share in advertising.

Interactive selling that bypasses retailers is a marketing strategy that will gain greater prominence over the next several years. Unlike advertising, this shopping method permits merchandisers to reach the consumer by cable television, videocasette catalogs, computer diskettes and telephone, and allows the consumer to make a purchase electronically. But the more imminent threat to newspaper advertising is the regional Bell operating companies (RBOCs) that want to provide electronic information services, including electronic Yellow Pages, over their phone lines. The newspaper industry has fought aggressively in the courts to keep the RBOCs from gaining entry to this market, but over the next few years Congress could allow them access, especially if the newspaper industry does not actively pursue this market. (See chapter 27, Information Services).

Even though these challenges loom, newspapers will be able to offer a greater variety of advertising products, faster and at lower cost to advertisers through greater use of computer-based technology and satellite transmission. By generating computerized databases that provide valuable information on demographics, lifestyles and buying patterns of readers, newspapers will be better able to meet individual advertisers' needs.

Daily newspapers will further expand the number of zoned editions to attract more local advertising. Zoned editions allow publishers to offer lower rates to advertisers wanting to place ads in only a part of a newspaper's press run. In addition to zoned news sections, publishers will offer more special-interest zoned sections in such areas as classified ads, food, entertainment and health. Greater use of computer-controlled equipment in newspaper mailrooms will allow fast and accurate insertion of these sections.

Newspapers will focus more on their own environmental issues over the next few years, especially newsprint recyling and hazardous wastes removal. They will initiate more voluntary programs in these areas in order to ward off greater government regulation.

Larger U.S. newspaper companies will give more consideration to investing in foreign newspapers and other media over the next few years as the media and telecommunications industries increasingly become global markets. Many of these companies already own broadcast media properties in the United States.—*Rose Marie Zummo Bratland, Office of Consumer Goods, (202) 377-0380.*

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PERIODICALS

As the economy grew softer in 1990, the periodical industry which overall fared well in 1989, became a victim of advertisers tightening ad budgets. Periodicals industry receipts were down about 0.5 percent in 1990 in constant dollars. Industry

Trends and Forecasts: Periodicals (SIC 2721)

(in millions of dollars except as noted)

						Percent Change			
Item	1987	1988[1]	1989[2]	1990[2]	1991[3]	1987-88	1988-89	1989-90	1990-91
Industry Data									
Value of shipments[4]	17,329	18,914	20,625	21,691	23,382	9.1	9.0	5.2	7.8
Value of shipments (1987$)	17,329	17,885	18,350	18,258	18,587	3.2	2.6	−0.5	1.8
Total employment (000)	110	115	121	120	122	4.5	5.2	−0.8	1.7
Production workers (000)	18.3	22.0	23.1	22.9	23.4	20.2	5.0	−0.9	2.2
Average hourly earnings ($)	11.06	12.32	12.69	13.33	—	11.4	3.0	5.0	—
Capital expenditures	246	257	—	—	—	4.5	—	—	—
Product Data									
Value of shipments[5]	16,492	18,196	19,834	20,865	22,492	10.3	9.0	5.2	7.8
Value of shipments (1987$)	16,492	17,166	17,646	17,563	17,879	4.1	2.8	−0.5	1.8

[1] Advance data from the 1988 Annual Survey of Manufactures.

[2] Estimate.

[3] Forecast.

[4] Value of all products and services sold by establishments in the periodicals industry.

[5] Value of products classified in the periodicals industry produced by all industries.

SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA). Estimates and forecasts by ITA.

receipts totaled $21.7 billion in current dollars. Consumer magazines' share of receipts was about 65 percent; business publications, 34 percent; and farm magazines, 1 percent.

After two years of healthy advertising page growth, ad pages in consumer magazines declined sharply in 1990. For business publications, ad pages decreased significantly, following a small drop in 1989. Circulation for consumer magazines rose moderately in 1990. Circulation growth for business magazines was up slightly. Magazines purchased mainly on the newsstand were especially hard hit in 1990.

With the slowdown in U.S. advertising spending, competition for ad dollars and audience—both among magazines and with their media competitors—became much more intense in 1990. Their debts on recently acquired properties in the face of dwindling advertising revenues compounded the gloomy financial picture for a number of large publishers.

Advertising

Advertising receipts' share of total magazine revenues in 1990 totaled about 56 percent. For consumer magazines, advertising accounted for about 51 percent of total receipts; for business publications, about 65 percent of the total.

As national corporations tightened their ad budgets in 1990, consumer magazine ad pages spiraled downward early in the year and never recovered. Ad pages for consumer magazines were down more than 3 percent after rising over 3 percent the previous year. Consumer magazine publishing groups that showed a substantial drop in ad pages during the first half included those focusing on women, home life, health, outdoor sports and hobbies, cars, newsweeklies and general editorial. Product categories posting a sizable loss in ad pages for magazines as of mid-year were cigarettes and tobacco, automotive, and computers and office equipment. Business publications saw their ad pages decline over 2 percent in 1990. Business magazine publishing groups showing the largest declines by mid-year 1990 over 1989 levels included automotive, electronics and food manufacturing. Publishing groups recording sharp gains included those covering the oil and gas and computer reseller markets.

Advertisers' total magazine ad spending in 1990 grew about 3.6 percent over the 1989 level, reaching $10 billion. This growth rate was far below the 9.2 percent rate reported in 1989. Consumer magazine ad spending was about $7 billion, up an estimated 3.5 percent in 1990; for business publications, ad spending totaled nearly $3 billion, up an estimated 4.0 percent. Over the past decade, magazines' share of total U.S. advertising expenditures has shrunk from 9.2 percent in 1980 to 7.7 percent in 1990.

Competition from both print and broadcast media, especially from television and direct mail continued to erode magazine publishers' advertising share. Also, among magazine publishers, competition for ad dollars was particularly heated in 1990 because of slower growing corporate and retail advertising budgets together with tremendous growth in new magazines in 1989. Some publishers attracted advertisers by cutting their ad rates and offering a bigger discount to any advertiser who placed ads in several magazines of the same publisher. Publishers also upgraded their value added programs to include special promotional tie-ins and multi-media packages. Other publishers raised ad rates to offset declining ad pages.

In recent years, special interest magazines have attracted more advertising for the magazine industry because of their ability to target the niche markets many advertisers want to reach. In the past year, even a number of general interest publications, such as *Time*, *Woman's Day*, and *Better Homes and Gardens*, began publishing special interest issues. These special titles cover such areas as health, personal finance, and education.

Circulation

Circulation receipts' share of total magazine revenues in 1990 was about 44 percent. For consumer magazines, circulation represented about 49 percent of total receipts; in business publications, about 35 percent.

According to Audit Bureau of Circulation figures for the first half of 1990, only 20 of the leading 55 consumer magazines in circulation saw their circulation increase over 1989 levels. Such popular magazines as *National Geographic*, *Sports Illustrated* and *People* were among the biggest casualites. Total magazine circulation was expected to rise about 3 percent in 1990, with subscription circulation up about 3 to 4 percent and newsstand circulation down 1 to 2 percent.

The sharp growth in new magazine titles during 1989 hurt existing titles sold mainly on the newsstand. With many new titles vying for newsstand space, some major magazines recorded circulation declines. Some newsstand losses have resulted from publishers raising cover prices. Other magazines, including *Time*, *Family Circle* and *TV Guide*, have lowered their circulation by cutting back on subscriptions that are unprofitable.

Industry Structure and Costs

With more than 500 new magazines launched in 1989, and a growing uncertainty in the economy in early 1990, magazine startups in 1990 were fewer. The *Gale Directory of Publications* reported a total of 11,092 periodicals in 1990.

There were fewer buyers for magazines in financial difficulties in 1990. Because many large magazine companies were carrying heavy debt burdens from earlier leveraged acquisitons, they were more selective in their buying in 1990. While there were a sizable number of purchasing transactions, each sale involved fewer titles and lower prices than the megadeals transacted several years ago.

Even with magazines' losses in ad pages and only moderate circulation gains, the profit picture was not bleak for many publishers. Production costs increased only moderately, and sluggish demand kept paper costs down. Magazine postal rates remained unchanged.

Overall, the magazine industry has remained profitable. The Magazine Publishers Association/Price Waterhouse annual financial survey for consumer magazines reported a 13.4 percent average pre-tax operating profit for the 171 magazines surveyed in 1989.

INTERNATIONAL COMPETITIVENESS

Exports of U.S. periodicals increased 20 percent, from $578 million in 1989 to $693 million in 1990. Major customers were Canada, with 78 percent of the total, the United Kingdom, with 5 percent; and Mexico and the

Netherlands, each with 3 percent. This growth was propelled by more publishers seeking markets abroad and stronger demand from countries interested in obtaining information from the United States. U.S. imports of periodicals were $148 million, up 6 percent over the 1989 figure. Higher prices for foreign magazines sold in the United States has slowed U.S. demand.

More U.S. magazine publishers are realizing the benefits of expanding their markets abroad. In the past, many U.S. magazine publishers have been exporting or printing abroad English- language editions. Now a growing number of publishers have started publishing local-language editions in foreign countries mainly under licensing agreements, joint ventures, or by establishing wholly-owned subsidiaries. During the past year, *Esquire* began publishing in Italy, Germany and Japan; *Life* and *Forbes* in Germany; and *Fortune* in Italy.

European and Asian publishers have also broadened their international operations, buying properties and licensing their own titles in the United States and elsewhere. During the past year both U.S. and European magazine publishers stepped up their selling and investment program in Eastern Europe and the U.S.S.R. For example, a group of U.S. investors recently started the *Moscow Business Journal* as a joint venture with U.S.S.R. publishers.

Outlook for 1991

With some improvement expected in the economy by mid-year, magazine publishers could realize a small gain in ad pages and moderate growth in circulation during 1991. U.S. magazine industry receipts are expected to rise about 1.8 percent in constant dollars. For consumer magazines, circulation gains will likely account for most of this growth, while for business publications growth will come mainly from ad pages.

With GNP projected to grow moderately in 1991 and corporate profits expected to rebound by the second half, U.S. advertising spending should show some improvement. With disposable personal income projected to grow at a slower rate, magazine circulation gains likely will be moderate. Anticipated shakeouts in both consumer and business titles could affect circulation growth.

With the exception of postal rates, magazines' costs are not expected to increase more than 5 percent. Under the postal rate proposals scheduled to take effect in February 1991, postal rates for magazines would increase an average of 23 percent, with publications traveling further facing higher increases.

Long-Term Prospects

If the economy grows at an average yearly rate of about 3 percent in constant dollars as forecast over the next 5 years, magazine industry receipts should grow at an average yearly rate of 1.5 to 3.0 percent, in constant dollars. This forecast also assumes that corporate profits and disposable personal income will grow at least moderately.

To succeed in the future, magazine publishers must do a better job of delivering the targeted audiences advertisers are seeking for their products. With ever-increasing competition both from print and broadcast media, publishers will offer more refined target marketing strategies and multi-media programs to advertisers. Greater use of selective binding printing technology, coupled with greater knowledge of the audiences for specific publications, will give advertisers the ability to reach narrowly targeted audiences by purchasing advertising in only part of a magazine's print run.

Advertisers will find more publications with the capacity to include personalized advertising messages and different ads for diverse groups of subscribers in various localities. This technology will permit magazines to compete more effectively with local newspapers and direct mail. Multimedia publishers in the magazine field likely will offer extras to advertisers, such as advertising tie-ins, including in-store promotions, television projects, books and videocassettes.

More magazines will follow the lead of *Time* and *Reader's Digest* and cut back on circulation in order to offer advertisers more quality circulation at a lower ad rate base. In cutting circulation, publishers will rid themselves of the high cost of attracting marginal readers, but will still need to convince advertisers that these refined circulation figures mean more interested audiences for their products.

On the circulation side of business, magazine publishers must tailor their editorial content to the individual interests of their readers and provide for their changing needs. Selective binding technology will allow publishers to accomplish this. *Publishing News*, *Time*, *People*, and *Sports Illustrated* have already moved in this direction by creating separate editions that permit advertisers to reach distinct subscriber groups. To lure more readers to their magazines, publishers will redesign their covers and editorial formats. Also briefer articles and better indexing of information will be used to attract readers short on time.

Magazines focusing on the young adult market will see their audience shrinking over the next few years, while those focusing on the middle years market will benefit from the aging of baby boomers. These middle-aged baby boomers will be more pre-occupied with leisure time spent at home and family concerns. Special niche magazines geared to this audience should do well.

Other issues that could affect magazine advertising revenues over the next few years are the ad taxes and restrictions being proposed by a number of states and the Congress. Taxes on advertising services and tax restrictions on advertising's deductibility would likely trigger cutbacks in advertisers' ad budgets. Proposed restrictions on tobacco and liquor advertising in magazines will be recurring issues for publishers over the next several years.

While recycling and waste disposal issues currently do not weigh heavily on magazine production, publishers are beginning to realize the impact these issues could have on their profits. Greater pressure will be placed on paper mills to produce magazine papers without the use of toxic chemicals. This situation could mean poorer quality paper at higher prices. (See chapter 10, Paper and Allied Products).

A growing issue for U.S. magazine publishers over the next few years will be whether to expand their foreign operations, especially with the lifting of the European Community's trade restrictions among its members. U.S. publishers would like to attract more international advertising to their publications and open up more distribution channels. More new magazines will have a global focus and will sell to an international rather than to a domestic market.—*Rose Marie Zummo Bratland, Office of Consumer Goods, (202) 377-0380.*

best copy available

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BOOK PUBLISHING

A soft U.S. economy, characterized by minimal growth in personal consumption expenditures, held publishers' receipts from the sale of books to $16 billion in 1990, an increase—adjusted for inflation—of 2.5 percent over 1989. Restrained school budgets kept textbook purchases flat in 1990, despite growth of elementary and secondary school enrollments. While library funds increased in 1990, publishers of technical, scientific and professional books had to compete for these revenues with publishers of scholarly journals and firms producing computerized information systems. Sales of trade books—works of fiction or nonfiction generally sold through bookstores—were aided by new store openings and sustained strength in demand for juvenile books.

Book publishing's employment rose to 79,000 in 1990, a gain of 1,000 employees over 1989. However, this employment level understates the true size of the U.S. book publishing industry (SIC 2731) since it reflects only those persons in the 2,298 establishments enumerated by the U.S. Bureau of the Census. Book industry sources point to a subculture of over 20,000 U.S. publishing firms, each producing one or more books annually.

Profits of book publishers suffered in 1990, although a higher pricing pattern helped counter slow growth in unit sales. While publishers achieved limited economies through improvements in their manufacturing and distribution operations, these savings were reduced by higher editorial, marketing and administrative costs.

Industry Transitions

Entering the 1990s, the U.S. book publishing industry reflects a series of juxtapositions: geographically dispersed, yet concentrated in shipments; subject to consolidation at the large establishment level, yet expanding exponentially with small and medium-sized firms; productive in controlling payroll and material costs, yet thwarted in translating cost savings into profits.

In step with many U.S. manufacturing industries, book publishing has followed population trends and increased the number of publishing establishments in the South and West. Shipments concentration, however, remains with firms located in New York City. The most recent Bureau of the Census data show little change in the percent of industry shipments held by New York publishing firms: 47 percent in 1987 compared to 49 percent in 1972. New York accounted for just 17 percent of the industry's establishments in 1987 compared to 31 percent in 1972.

The book industry's largest firms—those with 100 or more employees—still account for most of the industry's shipments: 77 percent in 1987 versus 80 percent in 1972. But the number of these firms has not increased appreciably—from 115 in 1972 to 127 in 1987—and they account for an increasingly smaller percent of the industry's total employment: 69 percent in 1987 versus 78 percent in 1972. In contrast, the number of small to medium sized book publishers (those with under 100 employees) nearly doubled—to 2,171 establishments in 1987 from 1,090 establishments in 1972. These firms account for a small but growing percentage of the industry's total employment: 31 percent in 1987 versus 22 percent in 1972.

Publishers have been very effective in reducing their major cost components—payroll and materials. Payroll as a percent of industry shipments dropped to 15 percent in 1987 from 20 percent in 1972, while the cost of materials as a percent of shipments fell to 29 percent in 1987 from 34 percent in 1972. These cost savings were the result of more efficient management and the increased application of computer systems to the industry's editorial, production and distribution functions. But translating cost savings into profits has been elusive, with higher marketing, advertising and administrative costs holding publishers' profit margins in check.

Markets

The book publishing industry serves a variety of interests: U.S. schools, libraries, institutions, professional groups, and

Trends and Forecasts: Book Publishing (SIC 2731)

(in millions of dollars except as noted)

Item	1987	1988[1]	1989[2]	1990[2]	1991[3]	Percent Change 1987-88	1988-89	1989-90	1990-91
Industry Data									
Value of shipments[4]	12,620	13,574	14,930	15,975	17,250	7.6	10.0	7.0	8.0
Value of shipments (1987$)	12,620	12,856	13,396	13,736	14,143	1.9	4.2	2.5	3.0
Total employment (000)	70.1	75.4	78.0	79.0	80.0	7.6	3.4	1.3	1.3
Production workers (000)	15.9	17.9	18.5	19.0	19.0	12.6	3.4	2.7	0.0
Average hourly earnings ($)	10.67	10.98	11.20	11.55	—	2.9	2.0	3.1	—
Capital expenditures	240	310	—	—	—	29.2	—	—	—
Product Data									
Value of shipments[5]	11,630	12,360	13,586	14,545	15,706	6.3	10.0	7.0	8.0
Value of shipments (1987$)	11,630	11,668	12,148	12,452	12,826	0.2	4.2	2.5	3.0

[1] Advance data from the 1988 Annual Survey of Manufactures.
[2] Estimate.
[3] Forecast.
[4] Value of all products and services sold by establishments in the book publishing industry.
[5] Value of products classified in the book publishing industry produced by all industries.

SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA). Estimates and forecasts by ITA.

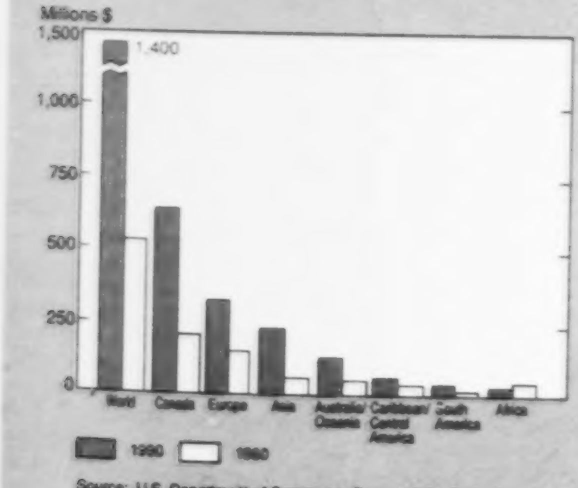
the general reader, as well as a growing international audience similarly distributed. A breakdown of major U.S. book categories, and each category's contribution to 1990's total estimated shipments of $14.5 billion, reveals the following: textbooks (28 percent), trade books (24 percent), professional books (19 percent), mass market paperbound books (8 percent) and all other books (21 percent).

Shipments of U.S. textbooks totaled an estimated $4.06 billion in 1990, and were almost evenly split between "elhi" (elementary and high school) and college markets. In recent years publishers have been disappointed in elhi sales, as growing enrollment levels—particularly at the nation's elementary schools—have not been matched with proportionate growth in funding for instructional materials. College textbook sales improved in 1990, despite stable enrollment levels, due in part to greater student acceptance of textbook titles appearing in less expensive paperbound rather than hardbound formats.

The U.S. market for trade books reached an estimated $3.48 billion in 1990, with books for adult audiences accounting for 75 percent of total shipments, and juvenile books representing 25 percent of the trade book market. Factors influencing adult trade sales include author recognition, retail store proximity, pricing, disposable personal income, literacy levels and product marketing. Since the mid-80s, sales of juvenile books have soared, reflecting a surge in births, more bookstores specializing in juvenile books, and strong parental concern for the development of positive reading habits.

Technical, scientific and professional (TSP) books had estimated sales of $2.76 billion in 1990, reaching a range of occupational and educational markets. Publications directed to the law, medicine and business represent 75 percent of all TSP sales. Publishers of TSP books are very active in international markets, with many firms finding export revenues accounting for 20 percent or more of total shipments.

Figure 26-1
Canadian Markets Attract U.S. Book Exports



Source: U.S. Department of Commerce, Bureau of the Census. 1990 estimates by International Trade Administration.

Shipments of mass market paperbound books were estimated to reach $1.16 billion in 1990, with publishers' revenue gains based primarily on price increases. Paperbound firms have had some success with genre publishing—a series of titles geared to romance, mystery, science-fiction, military and western themes— but unit sales have remained in the 400-500 million range since the early 80s.

Other book categories include religious, subscription reference, mail order, book club and university press books—each representing between 2 to 5 percent of the U.S. book total. Publishers of religious books fared well in recent years, with 1990's estimated shipments of $769 million indicating a large audience for works addressing the spiritual side of man's existence. Subscription reference books totaled an estimated $539 million in 1990, but future growth in this product category is tied to consumer acceptance of information in electronic formats.

Combined shipments of book club and mail order publications in 1990 were estimated to reach $1.57 billion. Unit sales in both book categories have been relatively flat, due to competition from the expanding number of U.S. bookstores and their discounting practices. Shipments of university press books totaled an estimated $218 million in 1990, with increasing numbers of university press titles reaching consumer audiences as opposed to the more traditional scholarly and library markets.

INTERNATIONAL COMPETITIVENESS

More U.S. publishers are finding excellent growth opportunities in the development of foreign markets. A currency exchange rate favoring the U.S. dollar, strong international copyright protection and recognition of English as the world's business and professional language have spurred U.S. export efforts. Conversion to the Harmonized System, effective January 1, 1989, improved the collection of international trade data, but adequate statistical coverage of cross-border U.S.-Canadian trade in books has required additional negotiations between U.S. and Canadian authorities.

Exports of U.S. books totaled an estimated $1.45 billion in 1990, 13 percent ahead of 1989's shipments of $1.288 billion. Export volume currently represents 9.5 percent of total product shipments, the highest level ever achieved by the U.S. book industry. Leading foreign markets for U.S. books continue to be the English-speaking countries of Canada, the United Kingdom and Australia, accounting for 60 percent of the U.S. export total. Over 50 percent of U.S. book exports represent combined shipments of textbooks and technical, scientific and professional books.

Imports of books by the United States grew to an estimated $880 million in 1990, a 10 percent improvement over 1989's imports of $800 million. The low-valued U.S. dollar has deterred import penetration. Combined shipments from the United Kingdom, Japan, Hong Kong, Italy and Canada represented approximately two-thirds of total U.S. book imports in 1990.

Outlook for 1991

Rising levels of school enrollment concomitant with gains in educational funding should push U.S. book industry shipments to $17.3 billion in 1991, an increase—adjusted for price increases—of about 3.0 percent over 1990.

Stronger book demand should enlarge the industry's workforce in 1991, with 1,000 new job opportunities pushing employment in book publishing to 80,000.

Beginning in 1991, U.S. student enrollments at all educational levels—elementary, high school and college—will be on the rise, a feat last achieved in the early 1970s. Despite prospects for a less than ebullient economy in 1991, publishers should expect a more coherent funding pattern for textbooks as the U.S. educational system reassesses its instructional priorities. Publishers will also be aided in 1991 by projected nominal gains in U.S. disposable income, and by continued demand for U.S. books from the international marketplace.

The U.S. book industry should anticipate higher costs in both paper and postage in 1991. Consumer demand for more use of recycled paper and library demand for acid-free paper will result in price increases for both materials. A new set of postal rates, effective spring 1991, will boost the special fourth class rate for books by about 15 percent.

Long-Term Prospects

A positive set of demographic, economic and technological trends should help the U.S. book publishing industry achieve annual shipments growth averaging 3.5 percent—adjusted for price increases—through 1995. This growth should be accompanied by moderate cost increases as paper mills and book printers become more efficient in the manufacture and printability of recycled and acid-free paper.

Enrollments in U.S. elementary and high schools are projected to rise by a combined 3.0 million students over the period 1990-95, improving publishers' markets for both textbooks and juvenile books. Sales of trade books should be aided by the formation of 6.1 million U.S. households between 1990 and 1995, and the addition of 10.2 million persons to the high income, heavy reading segment of the U.S. population aged 35 to 54 during this time frame.

Markets for college textbooks and technical, scientific and professional books may not increase rapidly over the period 1990-95, since college enrollments are not expected to grow and library budgets—already pressed to keep up with inflation—will be addressing their serial subscriptions and electronic information requirements as well as budgets for books.

The economics of U.S. bookstore operations bode well for U.S. publishers. Rapid growth of mall-oriented retail bookstore chains has not come at the expense of the nation's independent bookstores, whose depth of titles, computerized book ordering/inventory control procedures, and sensitivity to local market conditions enables independent stores to compete effectively with the major chains.

A trend toward store specialization—in travel, occult, juvenile, mystery, etc.—developes stronger markets for books in these genre. The success of both mega-stores—bookstores with large square footage offering upwards of 50,000 titles—and all-night bookstores gives publishers with strong backlists (books retained in inventory, with small but stable markets) renewed opportunities to market their products.

Advances in technology should help publishers in their continued search for new markets. The development of CD-ROM systems enables publishers of reference books to offer more current information to their primary audiences of libraries and institutions. The linkage of sophisticated typesetting software to LED (Light Emitting Diodes) printers provides customized textbooks for college classrooms. This process may also enable publishers to provide local school boards with limited edition textbooks more in line with regional preferences. The availability of low-cost typesetting and book design technology eases the entry of new U.S. publishing establishments and should push annual book title production to the 60,000-70,000 level by 1995, up from the current level of 50,000-55,000 titles per year.

A series of international activities should have a favorable bearing on U.S. sales of books abroad. Conclusion of the Uruguay Round of GATT negotiations is expected to strengthen international copyright protection. The opening of Free Trade Agreement discussions between the United States and Mexico—with the possibility of later extending these discussions to other countries in the Southern Hemisphere—should bring this geographic sector's share of total U.S. book exports well above the current level of six percent. But the U.S. publishing industry's strongest focus will be on the European Community countries, Eastern Europe and the USSR. The rapid establishment of copublishing relationships and joint venture operations with indigenous publishing firms in these countries should be the springboard by which the U.S. book industry affects a global approach to publishing.—*William S. Lofquist, Office of Consumer Goods, (202) 377-0379, September 1990.*

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American Bookseller, American Booksellers Association, Inc., 137 West 25th Street, New York, NY 10001. Telephone: (212) 463-8450.

BP Report, SIMBA Information, Inc., P.O. Box 7430, Wilton, CT 0689 Telephone: (203) 834-0033.

CPDA News, Council for Periodical Distributors Association, 60 East 42nd Street—Suite 2134, New York, NY 10165. Telephone: (212) 818-0234.

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COMMERCIAL PRINTING

Despite a soft economy and a marked increase in materials' prices, shipments of the U.S. commercial printing industry (SIC 275) exceeded $55 billion in 1990, an increase of 3.0 percent over 1989—as measured in constant (1987) dollars. Expanding markets for labels and general job printing, as well as print advertising materials such as catalogs, telephone directories, direct mail, coupons and inserts, compensated for declines in magazine and financial printing. The industry's profit margins suffered in 1990 as the higher prices attached to petroleum-based materials and supplies cut into previous gains made by relatively lower increases in the costs of labor and paper.

Trends and Forecasts: Commercial Printing (SIC 275)

(in millions of dollars except as noted)

Item	1987	1988[1]	1989[2]	1990[2]	1991[3]	Percent Change 1987-88	1988-89	1989-90	1990-91
Industry Data									
Value of shipments[4]	44,731	47,955	51,715	56,075	58,930	7.2	7.8	6.5	7.0
Value of shipments (1987$)	44,731	46,478	48,106	49,560	51,285	3.9	3.5	3.0	3.5
Total employment (000)	563	562	570	575	580	1.6	1.4	0.9	0.5
Production workers (000)	401	405	410	415	420	1.0	1.2	1.2	1.2
Average hourly earnings ($)	9.93	9.99	10.15	10.35	—	0.6	1.6	2.0	—
Capital expenditures	2,012	1,883	—	—	—	−6.4	—	—	—
Product Data									
Value of shipments[5]	43,952	47,242	50,965	54,300	58,135	7.5	7.9	6.5	7.1
Value of shipments (1987$)	43,953	45,787	47,390	48,810	50,520	4.2	4.7	3.0	3.5

[1] Advance data from the 1988 Annual Survey of Manufactures.

[2] Estimate.

[3] Forecast.

[4] Value of all products and services sold by establishments in the commercial printing industry.

[5] Value of products classified in the commercial printing industry produced by all industries.

SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA). Estimates and forecasts by ITA.

The level of commercial printing employment reached 575,000 in 1990, a 4 percent increase over 1987. This expansion of the work force occurred despite the industry's rapid pace of mergers, acquisitions and consolidations during the 1987-90 time frame. Two-thirds of the new employees assumed production worker functions, with the remainder assigned to clerical, sales or administrative tasks.

Geographic Trends

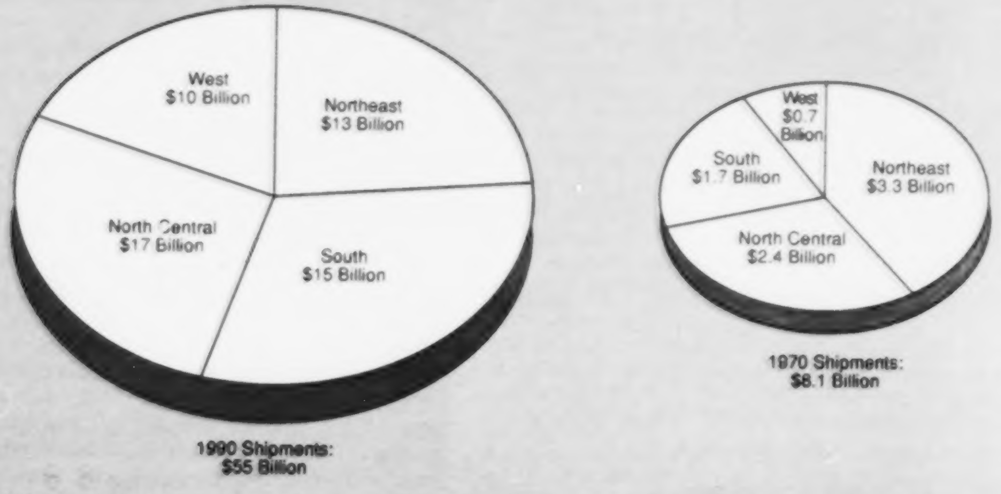
Shifts in the patterns of the U.S. population have long been recognized by its printing industry. As noted in chart 28-2, shipments by U.S. printing establishments located in the South and West represented 45 percent of the U.S. total in 1990, up from 30 percent just 20 years earlier. The relative decline in printing shipments by firms in the Northeast—to 24 percent of the U.S. total in 1990 from 41 percent in 1970—reflects less a static economy but rather the substantial business and population growth experienced by states in the South and West. The ability of North Central printers to maintain their share of the total U.S. market for printing over the 1970-90 period is indicative of economies of scale resulting from relative advantages in ready access to raw materials and their central location to the nation's highway network.

Products and Processes

Commercial printers have their choice among a variety of technological processes. While each process is designed to meet the needs of specific markets, economic realities may finally dictate which process should be used. Table 1 shows the U.S. printing industry's major markets.

The gravure process is geared to publication printing: for catalogs and magazines with production runs of one

Figure 26-2
Regional Demand for Printed Products Speeds Up in South and West



Source: U.S. Department of Commerce, Bureau of the Census. 1990 estimates by International Trade Administration.

million copies or more. Softness in U.S. magazine advertising in 1990 was especially pronounced in long-run consumer publications, adversely affecting revenues of gravure printers. A long term trend away from mass market catalogs—in favor of smaller-sized, target-oriented, specialized catalogs—also has negatively affected gravure printing. Continued efforts to apply laser technology to gravure cylinder engraving may improve the eight percent share of total U.S. printing held by the gravure process in 1990.

Flexographic printing is applied to packages, labels and wrappers because of the low cost and simplicity of press operation. Flexography increased its share of U.S. printing in 1990 to four percent, reflecting increased demand for pressure-sensitive labels, and for printing on such non-paper substrates as film, metal and foil.

The screen printing process also attracted a four percent market share in 1990, based on its ability to apply strong ink concentrations on advertising items such as display and point-of-purchase materials and on textile fabrics. Many of the products printed by the screen process—menu covers, posters, signs, decals, card cards—are linked to demand for advertising or to growth in U.S. business activity.

Letterpress printing, which accounted for as much as 45 percent of total industry shipments in 1960, continues to decline as a viable printing process. Estimated 1990 shipments of $4.9 billion of letterpress printed products represents only nine percent of the U.S. total. Its incompatibility with computerized typesetting and its slow turnaround between print jobs severely limits its competitiveness with other printing processes. But letterpress plants continue to produce labels, wrappers, newspapers and business forms.

Table 1: Estimated Sales of Printed Products

(in billions of dollars)

Printed Products	Estimated 1990 sales
TOTAL, all products	$55.0
Advertising	$19.0
Magazines and periodicals	8.0
Catalogs and directories	7.0
Labels and wrappers	5.0
Financial and legal	3.0
All other printed products	13.0

SOURCE: U.S. Department of Commerce, International Trade Administration

The lithographic printing process—also called offset printing—accounted for 75 percent of all U.S. commercial printing in 1990. Its high speed, fast turnaround and linkage to computer operations make lithography the process of choice for virtually all of the printed products listed in table 26-1. One exception is flexography's dominance of the labels and wrappers market. Lithography's fortunes are tied especially to U.S. demand for printed advertising materials. The revenues of many magazine printers were adversely affected in 1990 by a decline in the number of U.S. periodicals and a fall-off in advertising pages. But revenues for catalogs, calendars, direct mail, inserts, coupons and telephone directories grew in 1990 in response to the promotional needs of U.S. businesses.

INTERNATIONAL COMPETITIVENESS

With some exceptions, U.S. commercial printers do not have a strong international trade orientation. Neither exports nor imports account for more than one percent of total domestic shipments. Exports of the U.S. commercial printing industry totaled an estimated $715 million in 1990, about 30 percent less than 1989's shipments of $891 million. The value of U.S. printed product imports in 1990 was estimated to reach $465 million, 4.5 percent above 1989's imports of $445 million.

The United States has a significant competitive advantage in financial and security printing. Estimated 1990 exports of stock and security certificates, financial documents, and postage and revenue stamps totaled $370 million, representing over half of all U.S. commercial printing exports. Exports of U.S. labels, catalogs, posters and trade advertising materials were $240 million in 1990 or 34 percent of the export total. The major trading partners for the U.S. commercial printing industry are Japan, Canada and the United Kingdom, whose markets represent about 50 percent of all U.S. exports of printed products.

The United States imports a wide range of printed items, but over 80 percent of the import total consists of labels, decals, calendars, catalogs, trade advertising and pictorial material. The principal suppliers—accounting for 50 percent of the U.S. import total—are Canada, Japan, and the United Kingdom. The same countries' markets account for 50 percent of U.S. exports.

A foreign presence is increasingly evident in the U.S. commercial printing industry, though not reflected in the low levels of exports and imports. Several of the largest U.S. printing firms are now foreign-owned, particularly by Canadian, German and Swiss interests. The large U.S. market for printed products attracted a surge of foreign investment in the 1980s, a condition that gives no indication of abating the 1990s.

Outlook for 1991

Commercial printers' shipments in 1991 should reach $58.9 billion, an increase—adjusted in constant dollars—of 3.5 percent over 1990. This rate of growth, well ahead of both projected GNP and the average for all U.S. printing and publishing industries, is predicated on stepped-up advertising, promotion, packaging and labeling expenditures beginning in 1991's second half. This increased demand for printed products should generate 5,000 new jobs, raising the commercial printing industry's 1991 employment level to 580,000.

Printing industry profit margins in 1991 are expected to show little improvement over 1990. Paper prices should remain stable as the result of North American mill capacity running slightly ahead of demand. But prices of petroleum-derivative printing supplies, such as film and chemicals, should rise in response to the increasing costs of oil.

Two additional cost factors facing U.S. printers in 1991 are postal rates and environmental clean-up efforts. Effective April/May 1991, higher U.S. postal rates will be levied on catalogs (up 20 to 30 percent), direct mail (up 10 to 20 percent) and periodicals (up 15 to 25 percent). These rates may initially dampen demand for these items. In addition, publishers and advertisers may call upon their contract suppliers—including the printing industry—to help absorb the impact of these rate increases. The public's concern with a cleaner environment will lead to greater paper recycling efforts in 1991, with recyclable printing paper commanding a price premium.

Long-Term Prospects

The commercial printing industry faces a series of challenges in the years immediately ahead. Competitive pressures from the electronic media could trim traditional print markets for newsletters, directories and other reference works. The cost impact of a cleaner environment in the 1990s may adversely impact profit margins. And fluctuations in the levels of advertising expenditures among the various print media could disrupt the industry's long range planning of capital expenditures. But the continued attractiveness of the U.S. printed product as an advertising and informational vehicle should permit the printing industry to sustain average annual shipments growth of 3.5 percent—adjusted for price increases—through 1995.

Many factors influence the demand for commercially printed products: advertising expenditures, levels of population, the number of business formations, extent of U.S. economic activity and growth of personal consumption expenditures. The printing industry's driving force is advertising, representing between 60 to 70 percent of shipment volume. Much print advertising is directed to an affluent, rapidly growing segment of the population—persons aged 35 to 54—whose numbers should expand by 16.2 percent, to 73.6 million persons, by 1995. Changing patterns of U.S. advertising—with less emphasis on building a product's brand awareness and stronger emphasis on supporting sales promotion—may lead to reduced revenue opportunities for magazine printers but increase shipments by printers of catalogs, direct mail materials and advertising inserts.

Commercial printing's cost structure will follow a different pattern in the 1990s. While labor costs should continue to decline as a percent of industry shipments, the relative costs of materials and supplies should hold steady after recording significant increases in the 1980s. Many cost gains in the 1990s will be environmentally derived. These gains will come through the use of recycled paper; soybean oil-based rather than petroleum-based inks; aqueous-based rather than solvent-based printing plates; and the increased expenditures required to meet tougher governmental standards on air, water and plant safety. Printers may meet these costs by dipping into capital expenditures. Annual plant and equipment expenditures of the commercial printing industry peaked at the $2 billion level in the mid-80s, but edged downward in the late 1980s in response to a slackening of demand and signs of industry overcapacity.

The globalization of print will take on new meaning in the 1990s. Just as U.S. advertising agencies were forced to follow their multinational clients into foreign markets in the 1980s, large U.S. printing companies will either establish plants abroad or set up a series of co-printing relationships offshore in response to international servicing of their U.S.-based customer/clients. The printing opportunities afforded by such linkages are especially welcomed by the countries of Eastern Europe and the USSR. Exports of U.S. printed products also will be enhanced in the 1990s as duty-free trade with Canada becomes fully implemented January 1, 1993, the result of the U.S.-Canada Free Trade Agreement. A similar trade agreement with Mexico is expected to be executed by the mid-90s. But the globalization of print will also result in stronger foreign competition, and higher levels of foreign investment in the U.S. printing industry. The United States remains by far the world's largest market for printed products. Its attractiveness is not lost on world-class printers.—*William S. Lofquist, Office of Consumer Goods, (202) 377-0379, September 1990.*

The 1990s will provide some of the most challenging commitments for the printing and publications industry.

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27

Information Services

All sectors of the information services industry covered within this chapter will show revenue increases in 1991 that will exceed GNP growth, some by large margins. Revenues of data processing services are expected to grow 16 percent; those for electronic information services, 20 percent. Use of videotex is expected to increase about 15 percent. Revenues of computer professional services are expected to grow 17.3 percent in 1991. Comparable growth rates appear to be sustainable in the near future.

Before reading this chapter, please see "How to Get the Most Out of This Book" on page 1. It will clarify questions you may have concerning data collection procedures, factors affecting trade data, forecasting methodology, the use of constant dollars, the difference between industry and product data, sources and references, and the Standard Industrial Classification system (SIC). For other topics related to the subject of this chapter, see chapter 29 (Telecommunications Services).

This industry is defined, in part, by the 1987 Standard Industrial Classification system, wherein data processing services establishments are classified in SIC 7374 and 7376; computer professional services in SIC 7371, 7373, 7379, and 8243; and electronic information services and videotex in 7375.

Table 1 summarizes the computer services industry according to the 1987 Census of Service Industries conducted by the Bureau of the Census.

Information services are both a strategic sector for national economic competitiveness and a growing share of the U.S. economy. Since 1965, for example, current dollar production levels (measured by revenues) in the computer software and services sector have grown in excess of 15 percent a year. The broadly defined information services industry employed about 2.4 million people in 1990 and indirectly supported another 2.7 million jobs. U.S. information services have traditionally maintained a positive trade balance.

Table 1: Computer Services Industry, 1987

SIC*	Number of Establishments	Number of Employees (thousands)	Receipts	Annual Payroll
			(millions of current dollars)	
7371	14,687	184.2	14,170.2	6,286.6
7372	3,392	55.7	5,894.2	2,052.4
7373	3,515	66.3	7,089.9	2,199.8
7374	7,332	202.7	14,068.4	4,580.0
7375	463	13.1	1,175.9	354.6
7376	738	18.5	1,198.2	505.2
7377	1,061	8.7	2,165.5	319.6
7378	3,693	53.3	5,749.1	1,717.1
7379	4,820	34.9	2,587.8	1,126.7
737	39,701	637.4	54,099.1	19,141.9

*For an explanation of the SIC system, refer to the introductory chapter of this Outlook. For descriptions of individual SIC numbers, refer to the Standard Industrial Classification Manual, 1987.

SOURCE: U.S. Department of Commerce, Bureau of the Census, 1987 Census of Service Industries.

A large part of the information revolution involves delivery of traditional information by means of the newest electronic technologies. Information services firms are finding innovative and cost effective ways to create, store, and manipulate information for their customers. An increasing number of large companies with production bases in other industries are providing information services to enhance their internal production and administrative expertise. By adding these services, firms expect to improve relations with their suppliers, agents, distributors, and customers.

During 1990, the information services sector achieved its predicted current dollar growth projections. However, a greater share than expected of these current dollar revenues came from inflation than from real economic growth, especially in the second half of the year. In 1991, it is anticipated that inflation will be greater than in 1990. Thus, for those information services subsectors projecting current dollar revenue increases equal to or less than 1990, there will be a decrease in real growth rates. Nevertheless, all subsectors show both positive real growth rates and growth rates above those of the national economy consistent with long-term trends.

Consequently, the subsectors will experience less employment turnover and an overall smaller increase in employment in 1991. The best employment prospects are for persons with foreign language capabilities and foreign marketing experience.

The longer the time lag between announcements of new computer hardware and prepackaged software and product release, the greater the customer uncertainty about making purchases. Computer professional services firms are concerned that an increasing time lag will reduce the services growth rates in 1991 and beyond.

INTERNATIONAL COMPETITIVENESS

The demand by both U.S. and foreign firms for U.S. information services appears to be insatiable. The worldwide trends of office and factory automation, and electronic data interchange will require larger expenditures for services per hardware dollar. In response to this demand, the future mix of establishments in the U.S. information services industry will feature more independent providers of services and more new startups as well as a greater number of exporters. Foreign marketing subsidiaries by U.S.-based firms will increase.

New methods of delivering information-related services have led to new growth in this industry, domestically and internationally. As recently as 1983, for example, local and metropolitan area networks, electronic data interchange (EDI) networks, fractional T-1 telecommunications circuits, and interactive telecommunications network-based services were almost unknown.

Today, services of this type are growing rapidly throughout the world. New alternative channels for sales, licensing, and distribution—as well as technical changes in internationally interconnected telecommunications transport networks—will further increase diversity in information delivery methods.

ELECTRONIC INFORMATION SERVICES

The 1990 revenues of the electronic information services industry reached an estimated $9 billion. Companies providing financial information services, such as consumer and business credit reporting agencies and money market reporters, account for the largest share of the industry's revenues. Transport information services operated by the major airlines has the second largest share. Growth of the industry is based on a strong U.S. economy, greater awareness and acceptance of electronic forms of information, wider use of personal computers, availability of diverse telecommunications services, and continued improvements in technology.

Electronic information services are provided through various media including online interactive delivery, compact disk-read only memory (CD-ROM), magnetic tape, floppy disk, interactive voice/audiotex, and online broadcast. Online delivery—which sends information from computers over telephones and broadcast systems to subscribers, personal computers or terminals—accounts for about 80 percent of the electronic information services industry revenues. Interactive voice/audiotex and information on CD-ROM are the fastest growing media for the provision of electronic information services.

The United States is the largest producer and consumer of electronic information services. Of the 4,000 databases available in the world, the United States produces 56 percent, Western Europe 32 percent, Canada 6 percent, Japan 2 percent, and the rest of the world, 4 percent.

INTERNATIONAL COMPETITIVENESS

The U.S. electronic information services industry derives an estimated 30 percent of its revenue from foreign sources. However, U.S. firms are taking steps to become even more competitive in the world market. In addition to establishing offices overseas, the U.S. firms are tailoring their services to attract additional foreign customers. One example is the translating of information into foreign languages. The industry, through its Information Industry Association, is working with similar organizations in 13 countries to forge new commercial relationships and to maintain open markets for trade and investment.

Of the industry segments discussed in this chapter, the electronic information services industry has the most foreign investors and vendors. Most have entered the U.S. market after acquiring electronic information service companies.

Videotex Services

Videotex is an easy-to-use interactive electronic service. Since no government or industry association statistics are available on videotex services, estimates are based on surveys of service providers and subscribers. The number of regular users is somewhat smaller than the number of subscribers.

Close to 40 fee-based commercial videotex systems and services are in operation. By early 1990, according to the *Interactivity Report* (see Additional References), the number of home subscribers to fee-based systems had reached almost 1.9 million, up about 20 percent from the preceding year. The largest of the nationwide home videotex services has nearly 600,000 subscribers. The French videotex system, the largest in the world, offers more than 10,000 services. By March 1990, the number of subscribers exceeded 5 million.

The role of Regional Bell Operating Companies (RBOCs) in producing information services is likely to remain unsettled through 1991. The Federal District Court currently is re-examining the line-of-business restriction that prohibits RBOCs from engaging in electronic information services. Some revisions to the decision currently permit RBOCs to transmit, but not produce, information services.

Outlook for 1991

Revenues of the electronic information services industry are expected to increase by 20 percent during 1991 reaching a level of $10.8 billion. The need by business organizations to obtain fast, accurate information on a global basis to maintain their competitive positions will account for the high growth rate. CD-ROM products and audiotex services will have the highest growth rates. However, some types of audiotex services might not survive if the U.S. economy is weakened. Growth in the number of videotex subscribers is likely to continue at 15 to 20 percent in 1991.

Long-Term Outlook

Demand for electronic information services is expected to increase at a high rate through 1995. If no serious downturns affect the economies of industrialized countries, the industry will have an average annual growth rate of 20 percent through the next five years. The audiotex (voice information services market) is expected to grow from $900 million in 1990 to $3 billion by 1993. The market for CD-ROM products is projected to reach $1.2 billion. During the 1990's, businesses will consider many electronic information services strategic rather than luxury services. Electronic information services providers will respond with broader, customized offerings.

Regulatory and legislative changes will be sought by information services producers and consumer protection organizations over the next five years. At the same time, the Federal Communications Commission is responding to of consumer groups' complaints of fraudulent and misleading practices of this segment of the industry.

The RBOC's will continue their efforts to ease business restrictions on them so that they can provide a wide range of information services. Issues of privacy and security will be examined in the United States, Europe and other countries beginning in 1991. Amendments to the Fair Credit Reporting Act of 1971 and legislation pertaining to computer security may be enacted. The issue of the availability of government information may require amendments to the Freedom of Information Act.

The electronic information services industry will become even more competitive during the early 1990's because of the greater availability of information. For some companies, the ability to develop valuable services using new technologies, such as digital video interactive (DVI) and high definition display, will be critical to their continued success.

U.S. firms will face increased competition from European and Japanese firms in the delivery of electronic information services. The European Community has developed an ambitious plan to establish a European information services industry to compete with the United States. To counter this development, U.S. companies are forming strategic alliances in Europe and in Japan to protect their positions and to take advantage of increased business opportunities.—*Mary C. Inoussa, Service Industries, (202) 377-5820, and (for Videotex) John Siegmund, Office of Service Industries, (202) 377-4781, September 1990.*

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DATA PROCESSING AND NETWORK SERVICES

The data processing and network services industry continues to experience a double digit growth rate. Revenues of the industry grew by 15 percent in 1990 and amounted to $31.2 billion.

Several trends account for the steady growth of the industry. Revenues for transaction processing services remain stable. These services include medical and insurance claims processing, payroll processing, and credit card billing and approval. During the early 1980's, companies and other organizations set up in-house data processing facilities.

This trend now appears to be reversing, with more organizations returning to outside sources for their data processing and network services needs. This reversal is occurring because of the inability of in-house operations to keep pace with technological changes and to maintain technical staffs. Companies are also seeking to reduce their information technology budgets by utilizing outside sources.

Third-party computer networks that perform electronic data interchange (EDI) services make an important contribution to the revenues of the data processing and network services industry. Expenditures on EDI services are growing at a rate of 56 percent annually and amounted to an estimated $500 million in 1990. EDI, which is the electronic exchange of business documents, has been used successfully for several years in the transportation, retail and grocery industries, and in government agencies.

The data processing and network services industry is comprised of over 2,000 companies—from small family-type operations to large multinational companies. The industry employs nearly 300,000 persons.

INTERNATIONAL COMPETITIVENESS

It is estimated that the data processing and network services industry derives 20 percent of its income from overseas sources. Foreign markets are becoming more important as their U.S. customers operate globally. Due to liberalization of telecommunications policies in many countries and the potiential for development of overseas information industries, opportunities overseas—especially in Europe and the Pacific Rim—will likely be more plentiful than in the United States.

Data entry is a growing service industry in the Caribbean area where there are large pools of educated, unemployed young workers. About 20 U.S. data entry companies are located in the Caribbean. The number of foreign firms providing data processing and network services in the United States is increasing. However, U.S. firms have a competitive advantage over foreign firms. Generally, the U.S. firms maintain superior software and equipment, a larger diversity of services, and better long-term relationships with their clients.

Outlook for 1991

The outlook for the data processing and network services industry in 1991 is for high growth. The revenues of the industry are projected to grow by 16 percent and amount to $36.1 billion. The growth will be fueled by trends towards subcontracting data processing, and increasing usage of EDI to exchange business documents in the private and government sectors.

Long-Term Prospects

The U.S. data processing and network services industry is expected to maintain an average annual growth rate of about 16 percent from 1991 to 1995. The most stimulating segments are expected to be EDI and facilities management. One market research firm expects its expenditures for EDI network services to grow from $200 million in 1988 to over $1.7 billion by 1993. The facilities management market is projected to reach $50 billion by 1994.

The structure and composition of the industry could change significantly if the Regional Bell Operating Companies succeed in getting restrictions removed, thus permiting them to provide information and computer services. Even without this permission, some network services companies will still have to decide on the interface with integrated services data networks (ISDN) being developed by the RBOCs.

Data protection and privacy issues are resurfacing because of the increasing amount of personal data stored in computers. In July 1990, the European Community issued a proposal aimed at achieving a higher level of protection for personal data. The proposal is being reviewed to determine what implications there might be for U.S. providers of data processing and network services.

Long-term international prospects are good for data processing and network service companies as more countries liberalize their telecommunications policies and develop their information services markets. Foreign markets for EDI services will also be sizable. A market research firm specializing in the information services industry expects the European market for EDI to reach $250 million by 1992. Most major data processing and network companies will form strategic alliances with foreign firms, or enter overseas markets through acquisition. Some firms will need to restructure their overseas operations over the next five years in order to be able to operate internationally.—*Mary C. Inoussa, Office of Service Industries, (202) 377-5820, September 1990.*

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U.S. Processing/Network Services 1988-1993, INPUT, 1280 Villa Street, Mountain View, CA 94041-1194. Telephone: (415) 961-3300.

COMPUTER PROFESSIONAL SERVICES

Computer professional service providers advise on such problems as the design and selection of computer and peripherals systems; computer and telecommunications linkages; and systems and network management. They also train on how to use computer systems, software, and combined computer and telecommunications networks. Computer professional services companies provide specific solutions to a client's business needs.

With the rapid advances in computer technologies, the professional services associated with them have also changed. Compared to five years ago, a markedly advanced level and mix of skills is needed to provide these professional services.

Industry Structure

In the United States, most firms in this sector remain independent, providing combinations of such services and frequently offering other types of services and goods. In Western Europe and Japan, a larger percentage of computer professional services firms are subsidiaries of corporate conglomerates and account for an even greater percentage of sector revenues.

In 1990, about 3,500 U.S. firms (other than sole proprietorships) primarily provided computer professional services. The principal offerings of more than 1,600 of these firms were systems integration services; the remaining 1,900 mostly offered other kinds of computer professional services.

Although start-up costs have been reasonably low for these firms, annual increases in the total number of companies have been modest in recent years, because new entrants have been matched by losses in the number of firms through mergers and acquisitions. The recent decrease in the availability of venture capital has tended to reduce the size, rather than the number, of start-up firms in this sector.

According to the industry, 1988 was the record year in both numbers and dollar values for mergers and acquisitions of computer professional services firms in the United States. In 1989 and 1990, the pace slackened somewhat, but remains ahead of overall economic trends. In Western Europe—in anticipation of the EC 1992 single market—the pace significantly accelerated in 1990 and is expected to further accelerate in 1991.

Large U.S. computer professional services firms are looking into possibilities of acquiring smaller Canadian firms to take advantage of the market-opening provisions of the U.S.-Canada Free Trade Area Treaty. Many U.S. firms have moved from joint venture operations to full service subsidiaries in many foreign markets, especially in Western Europe. Most larger U.S. firms devoted considerable resources to evaluating potential markets in Eastern Europe in 1990. This effort is expected to begin providing revenues in 1991, although competition from EC member firms remains highly intense.

A growing number of U.S. firms are foreign owned, particularly by companies headquartered in the United Kingdom. The majority of these are acquisitions rather than start-up subsidiaries. Acquisitions by Japanese and Canadian firms increased in 1990 and are expected to continue to increase during the next five years. For the near future, firms in the rest of the world are more likely to penetrate the market as subcontractors for U.S. firms involved in fulfilling multinational contracts than in creating wholly owned subsidiaries.

Besides those companies that mainly provide computer professional services, there are companies and sectors that earn significant revenues with expanded services. Manufacturers and distributors of computer and peripheral equipment, for example, increased their sales of services in the United States and in Western Europe. A growing number of telecommunications firms are providing computer services—especially systems intergration sevices as outgrowths of their own equipment-marketing efforts. A number of nonprofit institutions and accounting and auditing firms are active participants in the market.

Revenue figures cited in this chapter include all earnings derived from computer professional services, regardless of the provider. Total revenues for computer professional services surpassed $44.4 billion in 1990. Of this amount, $13.9 billion was from custom programming services—an

Apple Computer

Because of steadily increasing use of computers, the domestic market for computer professional services is thriving. Revenues are expected to grow 17.3 percent in 1991.

18.5 percent increase from 1989. Computer consulting and training services accounted for $15.6 billion in revenues, while integrated systems services produced more than $14.9 billion.

Automating for Competitiveness

The domestic market for computer professional services is one of the faster growing segments of the U.S. economy. This market is thriving because organizations in both public and private sectors face increasingly complex problems of office and factory automation. These organizations have to rely upon outside help in designing appropriate automated systems and in making them work. The need for these systems is fueled by increased foreign competition, changes in patterns of national growth and consumption, and changes in government regulations. All these factors affect patterns of commercial interaction among companies, their suppliers and customers.

Computer professional services continue to benefit from steady growth in the numbers and features of personal computers, workstations, and network terminals. During 1990, continued growth in the use of electronic mail systems and services paced the growth in revenues from professional services. In the United States there are about 3 million electronic mailboxes. A small but significant number of these mailboxes are on international networks operated by multinational corporations.

Demographic and technological changes have created notable economic advantages for U.S. firms that contract out for computer professional services. This customer base helps U.S. firms develop competitive advantages in offering services internationally.

Market Changes

Custom programming—by either in-house staffs or contractors—has grown at a slower rate. The slowdown is due largely to the proliferation of prepackaged software, fourth generation languages, and computer-assisted software engineering tools. At the same time, this software proliferation has increased the need for outside professional training services. The wide availability of prepackaged software has led many providers of custom software to move from software development to software enhancements and modifications as their primary sources of revenues. Also, the importance of documentation services within this sector is growing.

Training services revenues have been growing fastest in CAD/CAM (computer-aided design/computer-aided manufacturing) and CAE (computer-aided engineering) applications, particularly for training in the use of graphics software in the automotive and aerospace sectors. At the same time, growth has slowed in training revenue from word processing and data transaction systems because the software has become more user friendly.

Systems Integration

In addition to firms that specialize in providing turnkey computer systems, data processing services companies, hardware and peripherals manufacturers, and software developers have found systems integration to be a lucrative business. Many of these firms are entering the field through new or expanded operating units; others are acquiring existing providers of services or merging to create new packages of offerings.

The revenues of systems integrators grew steadily throughout the 1980s. U.S. Government procurement has been an important element in the growth of integrated systems services. However, the Federal share of the systems integration market has been declining and is expected to continue to decline through 1994 at least. State and local government procurements are expected to do no better than to maintain their market share.

The growth of systems integration services, both in the United States and abroad, is difficult to assess on the basis of no more than revenue data. Longitudinal growth rates were traditionally understated because they included a declining share of equipment costs. The value-added services component of turnkey systems continues to increase, but the cost per calculation or function of computer memory is continuing a dramatic long-term decline. On the other hand, an increasing share of the total revenues of a firm is derived from repair and maintenance services embedded in systems integration contracts.

The increasing use of single-procurement contracts for integrated computer-related services obscures trends in the revenues for any one component of those services. This use has changed competition patterns in the subsector. Only a few very large firms can afford to prepare bids on the largest projects; medium and small firms must increasingly form strategic alliances to make such bids jointly.

The most notable growth segment in U.S. systems integration in 1987 and 1988 was desktop publishing systems. During 1989, their significance within this subsector slowed in the United States but began to gain prominence in Western Europe. During 1988 and 1989, the fastest growing industrial sector served was telecommunications. In 1990, no single sector was prominent in growth rates in the United States. By contrast, in the European Community, financial services institutions (especially banks and insurance firms) markets paced the growth.

Outlook for 1991

Revenues from computer professional services are expected to reach nearly $52.2 billion in 1991, an increase of 17.3 percent in current dollars. Systems integration revenues will reach $16.8 billion; computer consulting and training services, more than $18.8 billion; and custom programming, $16.6 billion, an increase of 18.8 percent.

An increasing share of revenues from custom programming has come from abroad. In 1991, more than 36 percent of all revenues for programming services—and a larger share of total profits—are expected to come from foreign clients. Services provided to foreign subsidiaries of multinationals based in the United States will continue to create opportunities for U.S. custom programming and design services to enter markets abroad.

Expanding computer related training in secondary schools, colleges, and universities—combined with increased numbers of software-based and video cassette tutorials available in retail stores—continues to challenge the growth of computer training firms. Nevertheless, revenues of this subsector will continue their dynamic growth; the increase for U.S. firms in 1991 is estimated to be 20.4 percent.

Long-Term Prospects

Compound annual growth rates (in current dollars) for computer professional services have exceeded 15 percent in the 1980s, despite variable economic conditions in the United States. Growth rates approached 20 percent a year, from 1986 through 1990. If the national economy remains stable and if foreign sources of revenue continue to increase, this industry sector should achieve average annual growth rates in current dollar revenues that will exceed 17 percent through 1994, and total revenues approaching $85 billion in 1994.

The West European market looks especially promising. A U.S. research firm projected that the West European market for computer professional services would grow an average of 24 percent annually and would reach $23.2 billion by 1992. This is a faster rate of growth than that projected for the U.S. market. Although changing currency conversion rates cloud the picture, even faster rates are projected for the Japanese and South Korean markets.

Computer training and consulting will continue to gain market shares within this expanding services sector, both in the United States and abroad. In effect, acquisition and use of computers by those who are marginally computer-literate will increase and will continue to reconfigure the professional services market.

The development of integrated services digital networks in telecommunications—which adds more computer intelligence into the network—will further blur distinctions between computer and telecommunications technologies. Development of these networks is now proceeding more rapidly in Western Europe than in the United States. Adapting to this new environment and its potentials for organizational productivity will require businesses both in the United States and abroad to purchase ever increasing amounts of computer professional services.

Computer and telecommunications services represent the infrastructure of the information age. The growing importance of service industries in the U.S. and world economies will increase dependence on this infrastructure. Providers of computer professional services have a bright future.—*Robert G. Atkins, Office of Service Industries, (202) 377-4781, September 1990.*

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28

Computer Equipment and Software

Shipments by the computer industry will increase 6 percent in current dollar value in 1991, following a 4 percent increase in 1990. Worldwide revenues of the U.S. software industry should increase 20 percent, matching growth in 1990.

Computer equipment and software includes seven specific industries: electronic computers (SIC 3571); computer storage devices (SIC 3572); computer terminals (SIC 3575); computer peripheral equipment, not elsewhere classified, (SIC 3577); and software—computer programming services (SIC 7371), prepackaged software (SIC 7372), and computer integrated systems design (SIC 7373).

Electronic computers include digital computers of all sizes, as well as computer kits assembled by the purchaser. Computer storage devices are such equipment as magnetic and optical disk drives and tape storage units. The category for computer terminals also covers teleprinters. Computer peripherals are printers, plotters, graphic displays, and other input/output equipment. Parts and components for computers and peripherals are included, as appropriate, in each of the first four SIC industries.

Before reading this chapter, please see "How to Get the Most Out of This Book" on page 1. It will clarify questions you may have concerning data collection procedures, factors affecting trade data, forecasting methodology, the use of constant dollars, the difference between industry and product data, sources and references, and the Standard Industrial Classification system (SIC). For other topics related to this chapter, see chapters 17 (Electronic Components and Superconductors), and 27 (Information Services).

The U.S. computer equipment industry continued to face slack domestic demand and intense price competition in several product sectors during 1990. Shipments rose only 4 percent to $71 billion, below the 1989 growth rate. First half revenue results for many leading U.S. firms were mixed. Sales remained sluggish for mainframes, minicomputers, and personal computers, but recovered for disk storage devices and continued to be strong for workstations, laptop computers, and local area network (LAN) equipment. Efforts to cut the Federal budget deficit, particularly defense spending, had a dampening effect on the industry's revenues. New orders rose 6 percent through June compared with a relatively flat first six months of 1989, indicating that a turnaround in shipments growth might occur by the end of the year.

Ongoing efforts of computer equipment firms to cut costs and increase profits in a weak domestic market continued to adversely affect employment. Total employment declined by 4 percent, to an estimated 277,000 workers; the 12,000 lost jobs were largely administrative and non-technical personnel. Of this total, only 2,000 were production workers laid off during plant closings. A number of companies managed to reduce their work forces through attrition and early retirement rather than layoffs. The Northeast region of the country was particularly hard hit by employment cut-backs because of stagnant minicomputer sales.

The computer equipment industry spends enormous sums on R&D to maintain its technological leadership. According to *Business Week's* R&D Scoreboard, the R&D expenses of a combined sample of 94 computer systems, peripheral, and communications firms reached $13.4 billion in 1989, the latest year for which information is available. This amount substantially exceeded spending in such other major industrial sectors as automotive, health care, and chemical. The computer equipment industry's average R&D investment as a percentage of total revenues was 8.4, more than twice the composite figure of 3.4 percent for all industries.

Trends and Forecasts: Computers and Peripherals (SIC 3571, -2, -5, -7)

(in millions of dollars except as noted)

Item	1987	1988[1]	1989[2]	1990[2]	1991[3]	Percent Change 1987-88	1988-89	1989-90	1990-91
Industry Data									
Value of shipments[4]	55,786	64,088	68,000	71,000	75,200	14.9	6.1	4.4	5.9
Total employment (000)	286	289	289	277	270	1.0	0.0	-4.2	-2.5
Production workers (000)	101	105	105	103	101	4.0	0.0	-1.9	-1.9
Average hourly earnings ($)	10.47	10.75	11.16	11.45	—	2.7	3.8	2.6	—
Capital expenditures	2,019	2,161	—	—	—	7.0	—	—	—
Product Data									
Value of shipments[5]	48,858	56,625	60,000	62,500	66,300	15.9	6.0	4.2	6.1

[1] Advance data from the 1988 Annual Survey of Manufactures.

[2] Estimate.

[3] Forecast.

[4] Value of all products and services sold by establishments in the computers & peripherals industry.

[5] Value of products classified in the computers & peripherals industry produced by all industries.

SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA). Estimates and forecasts by ITA.

U.S. corporate and university research laboratories have been working on several projects that may affect the development of computer systems throughout this decade and into the next century. In termsof breakthroughs that may lead to advanced circuitry, university researchers have experimented with quantum-effect electronic devices that have features 3,000 times smaller than the diameter of a human hair (molecular electronics). A private sector laboratory has also used a scanning tunneling microscope to maneuver and position individual atoms on a surface, holding out the promise of manufacturing microscopic electric circuits and extremely dense data storage devices. At the systems level, other private sector researchers have successfully demonstrated a prototype optical computer using lasers, lenses, and mirrors, rather than electronic circuitry, to move, retrieve, and process data. These developments may pave the way for computers that are substantially smaller and orders of magnitude faster than machines currently on the market.

Capital expenditures in the industry slowed in 1989. The annual survey by *Electronics Business* magazine showed that worldwide capital expenditures of a combined sample of 34 leading U.S. computer hardware firms for plant and equipment rose only 9 percent, to just below $12 billion. This growth was less than half that of 1988. Within the sample, desktop computer suppliers boosted spending an average of 38 percent, while a significant number of minicomputer and peripheral equipment manufacturers cut back their expenditures sharply. IBM played a particularly important role by investing $6.4 billion, more than half of the entire sample's total spending, to improve its production facilities around the world. Several industry observers expected growth in capital spending to continue in 1990.

INTERNATIONAL COMPETITIVENESS

Total U.S. computing equipment exports grew by 15 percent to $24.7 billion in 1990, signifying an increase in overseas demand. Canada and Japan each accounted for 13 percent of total U.S. electronic computing equipment exports in 1990. As expected, exports to Eastern Europe surged, although they remained a small portion of total U.S. trade. The Western European market bought 47 percent of U.S. exports, up 6 percent over 1989, and should continue to increase its computing equipment purchases, albeit at a slower rate than expected as a result of the imminent integration of the European Community (EC) in 1992. EC92 is the merger of 12 Western European countries, which constitute a single market of 325 million people with a Gross Domestic Product of $4.5 trillion and a 1988 per capita income of $13,770. Although not expecting to be fully operational until 1992, the EC member countries are already gearing up for competition with other world markets.

U.S. Exports and Imports
Computers and Peripherals
(in millions of dollars except as noted)

SIC	Industry	1989	1990[1]	1991[2]	Percent Change 1989-90	Percent Change 1990-91
357A	Computers & Peripherals					
	Value of exports	21,500	24,746	27,220	15.1	10.0
	Value of imports	21,371	25,200	28,772	17.9	14.2

[1] Estimate
[2] Forecast
SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA). Estimates and forecasts by ITA.

Imports increased by 8 percent over 1989 to roughly $25.2 billion in 1990, most of that due to significant growth in imports of peripherals and parts. Imports of peripherals and parts from Canada jumped by 59 percent; peripherals from Japan rose by 20 percent; peripherals and parts from Singapore increased by 26 percent; and parts from Taiwan expanded by 75 percent. Offshore investment in manufacturing facilities by U.S. firms contributed to the rapid growth of imports from Singapore.

U.S. Trade Patterns in 1989
Computers and Peripherals
SIC 3571, 3572, 3575, 3577
(in millions of dollars, percent)

Exports	Value	Share	Imports	Value	Share
Canada & Mexico	2,909	13.5	Canada & Mexico	2,244	10.5
South America	766	3.6	South America	43.1	0.2
European Community	7,755	36.1	European Community	1,279	6.0
East Asia NICs	2,565	11.9	East Asia NICs	8,507	39.8
Japan	2,861	13.3	Japan	8,524	39.9
Other	4,644	21.6	Other	774	3.6
World Total	21,500	100.0	World Total	21,371	100.0
Top Five Countries					
	Value	Share		Value	Share
United Kingdom	2,864	13.3	Japan	8,524	39.9
Japan	2,861	13.3	Singapore	3,542	16.6
Canada	2,342	10.9	Taiwan	2,374	11.1
West Germany	2,213	10.3	Canada	1,504	7.0
Netherlands	1,211	5.6	South Korea	1,279	6.0

See "How to Get the Most Out of This Book" for definitions of the Country Groupings.
SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA).

This trade activity led to the first overall U.S. trade deficit in electronic computing equipment. While the movement into deficit was led by the strong growth in peripheral and parts imports, imports of computers actually declined. This situation reflected the competitive strength of U.S. systems suppliers, who often manufacture complete systems in the United States from imported parts and subsystems. U.S. computing equipment trade data reflect the overseas sourcing patterns and subsidiary operations of this globally-based industry. For example, in 1990 computers represented 32 percent of U.S. exports, but only 10 percent of the imports. The overseas sourcing of peripherals was evidenced by the fact that these products represented 55 percent of total equipment imports, as shown in Table 1.

Foreign manufacturing facilities in the United States, with their related exports and imports, complicate the use of trade data as a measure of the U.S.-based industry's competitive status. For example, although the trade deficit suggests that the production base in the U.S. is eroding, the true competi-

Table 1: Composition of 1990 U.S. Computer Trade
(in percentages)

Item	Exports	Imports
Computers	32	10
Peripherals	25	55
Parts	43	35

SOURCE: U.S. Department of Commerce: Bureau of the Census and International Trade Administration.

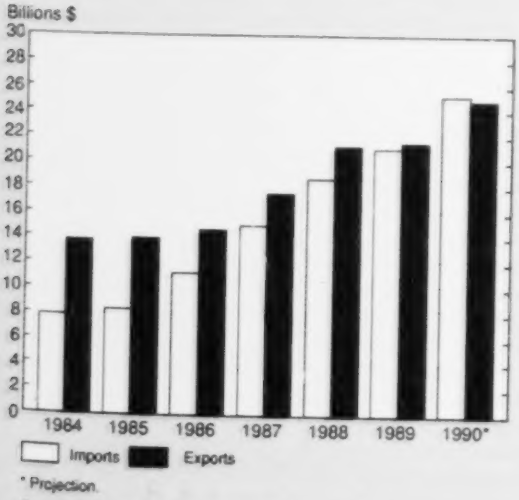
tive picture of the U.S. computer industry can only be found by excluding foreign manufacturing facilities located on U.S. soil and including U.S.-owned foreign production.

Rising imports and slow growth in the U.S. market combined to increase the share of imports as a percentage of apparent domestic consumption from 35.7 percent in 1989 to 40 percent in 1990. Apparent domestic consumption grew by only 4 percent in 1990, compared to previous rates of 17 and 10 percent in 1988 and 1989, respectively.

Foreign firms have continued to invest in the U.S. computer industry at a rapid pace. Cumulative foreign direct investment within the office and computing machines sector (SIC 357), which consists largely of computer manufacturers, rose nearly 50 percent to $4.1 billion in 1989 alone. In particular, outlays by foreign companies to acquire U.S. firms and to establish businesses and plants in the United States increased by roughly $500 million. Among the factors contributing to this upsurge in investment were a weak dollar relative to other major currencies, which lowered the cost of U.S. assets; the need of cash poor firms in the United States to obtain abundant, cheap capital to finance their R&D and operational expenses; and foreign interest in gaining access to the latest U.S. technological advances.

The Japanese have emerged as major foreign investors. They have acquired equity positions in 53 U.S. computer equipment and 11 software firms since 1980, with most of that activity taking place over the last 5 years. They have also substantially expanded their manufacturing and research in the United States. According to recent Commerce Department studies, Japanese suppliers wholly own 13 plants producing such computer peripherals as printers, keyboards, and disk drives. Seven plants produce computer-related components; another 3 manufacture personal computers and laptops. Their more than 20 R&D centers are located mainly in California and the Northeastern states, where they can monitor important technological developments within leading U.S. companies and university research laboratories. The research efforts of these Japanese-owned facilities have been largely focused on software, data storage, and workstation development.

Figure 28-1
Electronic Computing Equipment Trade Balance 1984-1990



* Projection.

Source: U.S. Department of Commerce, Bureau of the Census.

Many industry groups in 1990 became increasingly concerned about such competitiveness issues as the high cost and lack of availability of capital in the United States, antitrust constraints against joint production, the decline in the quality of the U.S. educational system, unfair trade practices, and the industry's growing dependence on foreign suppliers for critical components and subassemblies. They generally expressed strong support for proposed federal legislation that would stimulate corporate R&D and ensure a healthy business climate. These proposals include a permanent but modified R&D tax credit, a reduction in the capital gains tax, and clarification of antitrust law to allow joint production consortia. The groups also reached a consensus on the need for better science and mathematics education, and the importance of maintaining an open and fair world trading system.

The world computer systems market increased in value almost 10 percent in 1990, to an estimated $150.9 billion, according to International Data Corporation. The United States was the largest single country market, representing more than a third of this total. Japan followed with $29 billion in computer system sales, and the combined Western European market was nearly as big as the United States, at $50 billion. Markets in both Japan and Europe grew more than twice as fast as the United States, at 13.5 percent and 10 percent, respectively. Personal computers and workstations accounted for approximately half of computer system sales in all world markets, and their 15 percent increase over 1989 in value of shipments substantially outpaced the growth rates of other types of computers. Japan remained oriented toward larger systems such as mainframes and minicomputers.

A report in mid-1990 by Computer Systems Policy Project, a coalition of chief executive officers from 11 major U.S. computer firms, noted that foreign competition has seriously eroded the industry's strong position in the world market and its technological leadership over the past decade. The U.S. share of world computer systems sales declined from 81 percent in 1983 to 61 percent in 1989. By contrast, Japan's share grew from 8 to 22 percent and Western Europe's share rose from 10 to 15 percent during the same period. U.S. capabilities have already either fallen behind or are being overtaken by the advances made by foreign firms in capital-intensive technologies. These include displays, storage devices, microelectronics, electronic packaging and manufacturing technology. The United States is still clearly ahead of its foreign competitors in technologies that stress creativity and are not capital intensive, such as software engineering, systems and applications software, data base systems, and processor architecture. However, this lead is expected to rapidly diminish if current trends continue.

Outlook for 1991

The value of shipments by the U.S. computer equipment industry in 1991 should increase by 6 percent (in current dollars), to more than $75 billion, given the expected recovery in the U.S. economy. Domestic business spending on computers, especially mainframes, should increase as users purchase or upgrade to systems introduced in 1991 with better price/performance ratios. Exports may also continue to expand as long as demand holds up in key Western European and Far Eastern markets. However, their growth should remain below the rate of increase projected for imports, resulting in a computer trade deficit that could reach $1.5 billion by the end of the year. Both total and production worker employment may decline once again, if U.S. computer firms continue to restructure their operations.

Long-Term Prospects

The U.S. computer equipment industry should experience further consolidation over the next five years through ongoing mergers and acquisitions, and the departure of technologically weak and cash poor firms. It should also become even more international in character. Strategic alliances with foreign companies will probably increase as U.S. firms seek out European and Asian partners to share mounting R&D costs through joint research and product development, and to gain access to low-cost, high-volume manufacturing capacity. Foreign participation in U.S. manufacturing may grow in turn. Subsidiaries of foreign companies may expand their U.S. operations by electing to locally produce some of the components and subassemblies used in their computer systems, as well as a wider range of peripherals. At the same time, U.S. offshore production may continue to expand to meet the particular needs of customers in key overseas markets and within major regions, such as the European Community after 1992.

If current trends continue, the U.S. computer skills and production base will favor design, systems integration, parts assembly, and software development. With semiconductors incorporating increasing amounts of a system on a single die, systems suppliers will work ever more closely with semiconductor firms to create new products. For example, by the mid-1990s, microprocessors will contain nearly 10 million transistors on a chip, or 10 times today's densities. This level of integration will allow manufacturers to place on a chip all of the elements of a 200 million instructions per second (MIPS) workstation.

Demand within the world information technology market will shift more toward software and computer services during the early 1990s, according to International Data Corporation's projections. Computer system (hardware) sales should only grow 9 percent annually, to around $212 billion by 1994, and represent less than 45 percent of this world market. The U.S. computer systems market will also decline in importance relative to other major overseas markets. It will still equal Western Europe in the total value of computers sold, but will be outstripped in growth by Japan and key markets in Asia, Latin America, and possibly Eastern Europe. Personal computers and workstation sales will continue to play a dominant role in the world computer systems market, accounting for 52 percent of its value.—*Tim Miles, (202) 377-2990; Heidi Hoffman, (202) 377-2053, Office of Computers and Business Equipment, September 1990.*

SUPERCOMPUTERS

Supercomputers are traditionally defined as computers with the highest processing speed and selling for the highest prices in any given period of time. The supercomputer industry experienced mild growth in 1990, bolstered mainly through increased sales of both mini-supercomputers (systems with operational speeds between 100 and 350 floating point operations per second, or megaflops), and massively parallel systems (computers with more than one 1000 processors). Supercomputer shipments worldwide reached a total value of $1.5 billion, up 13 percent from 1989. Shipments of high-end supercomputer systems with operational speeds of over 350 megaflops posted another increase in 1990, as the total number of units shipped approached sixty. Industry sources estimated that 600 mini-supercomputer and massively parallel systems have been shipped—10 times the number of high-end systems—although Dataquest Incorporated puts the figure at about 800. There was one new entrant in the field, but no major new supercomputers were introduced by existing vendors.

INTERNATIONAL COMPETITIVENESS

Throughout the last decade, U.S. manufacturers of high-performance systems were extremely successful in exporting their products, with a majority of shipments going to Japan, West Germany, France, and the United Kingdom. Nevertheless, U.S. companies had little or no success selling to the Japanese government. The United States and Japan implemented a Supercomputer Procurement Agreement in 1987 to assist in opening up the Japanese public sector market. As no U.S. sales occurred subsequent to the signing of that agreement, the United States Trade Representative ruled it unsuccessful under Section 301 of the Omnibus Trade and Competitiveness Act of 1988, mandating a major revision of the language. The ensuing bilateral discussions ended in March 1990, and a new agreement was signed by the two governments in June.

The new agreement provides for a more open tendering process in Japan, with evaluations based largely on real-world (rather than theoretical) performance of supercomputers in the marketplace. It also restricts price discounting of up to 80 percent of retail price. Largely as a result of this new agreement, a U.S. firm was awarded a contract with the government-funded University of Tohoku Institute of Fluid Science in August 1990. Four other Japanese public sector procurements went to Japanese manufacturers during 1990.

U.S. firms continued to lead the world in production of multiple processor vector systems. Similar Japanese systems, were expected to become available during the course of the year, but failed to materialize in other than scaled-down single-processor models. The Japanese now plan for additional processors to be added at a later date to those systems. One Japanese manufacturer said its four processor system would have a theoretical top speed of 22 billion floating point operations per second (gigaflops), but the machine was not made available for benchmark testing in 1990.

The market for massively parallel systems is beginning to come into its own. There is still a shortage of software capable of effectively using the power of a such large numbers of processors. Nevertheless, producers of these computers are making headway by developing new types of applications software and marketing their systems as specialty problem solvers.

Midrange supercomputers, which are generally in the $1 to $5 million price range and have processing rates of less than 350 megaflops, also sold well in 1990. These computers have been popular for applications in laboratories and research divisions which involve only a few users and which have limited high-performance needs.

The fiscal 1991 Federal R&D budget contains a total of $469 million in funding for the five-year Federal High Performance Computing Program, which, if adopted, would augment the $500 million that the Department of Energy, the Department of Defense, NASA and the National Science Foundation (NSF) jointly spend on advanced computing research each year. If funded by Congress, this program will focus on four principal areas: high-performance computing systems, advanced software technology, the National Research and Education Network, and human resources.

A primary objective of the plan is to support domestic supercomputer R&D. This is achieved through Government purchase of early market systems and the funding of research that leads to the development of advanced supercomputers.

Additionally, through the support of research on so-called "grand challenges,"—problems beyond the processing capabilities of today's supercomputers—the plan would help companies develop software algorithms for the next generation of supercomputers. The initiative calls for the creation of a nationwide high speed communications network capable of transmitting billions of bits of data per second. This network would provide users with access to high-performance computing in research communities across the country—an estimated 1,000 members of government, industry, and academia. Finally, the proposal would allocate between $15 million and $30 million per year to foster the human resource base in supercomputing, as well as increase the number of doctoral degrees awarded in computational science to 1,000 per year.

Outlook For 1991

The global market for all types of supercomputers is expected to grow by about 13 percent, to $1.7 billion, in 1991. The market for high-end systems will increase by 5 percent, to $910 million, as the first of the new generation of U.S. computers with operational performance levels over 5 gigaflops become available. Mini-supercomputers and massively parallel systems are expected to continue their growth, achieving some expansion at the expense of high-end systems. The success of the generation of Japanese systems first installed during 1990 will depend on their ability both to use multiple processors and to expand their applications software base. In the past this has been a weakness of Japanese industry resulting in a lower level of exportable systems.

The first funds for the high performance computing program should be available during 1991. Other computer-related R&D items in the budget request were $118 million for advanced imaging technologies and $12 million for high definition systems.

Long-Term Prospects

The Defense Advanced Projects Research Agency (DARPA) has awarded two U.S. high performance computer firms multimillion dollar contracts to jointly build a computer system with a theoretical peak performance of 1 trillion operations per second (teraops), about 250 times faster than currently available supercomputers, by the mid-1990s. The actual performance of this system will be considerably slower, but the architectural models which will result from the development program should lead the way to the next generation of supercomputing. In conjunction with the National Research and Education Network (NREN), DARPA has also teamed up with the NSF to provide $15.8 million over the next three years to the newly formed Corporation for National Research Initiatives, which will coordinate the efforts of five university, government, and corporate research groups developing the hardware and software for a computer network capable of transmitting data at the rate of 1 billion bits (gigabits) per second.

Supercomputers with large numbers of processors will continue to make their way into the mainstream of the industry, dependent upon the ability of companies to develop software applications. Those systems defined as moderately parallel, having around 25 processors or less, will maintain their superior performance capability as multi-use systems and be especially successful as workhorses at the high-end of the market.—*Jonathan Streeter, Office of Computers and Business Equipment, (202) 377-0572, September 1990.*

MAINFRAMES

Mainframes are high performance computers used principally for such large-volume, general-purpose applications as on-line transactions, batch, decision support, and interactive processing. Low-end, uniprocessor models range in price from approximately $600,000 to a few million dollars. High-end mainframes with up to six central processing units can exceed $15 million. The market consists largely of users who upgrade to these higher performance systems or purchase mainframes to augment their existing systems.

The performance of these computers is often measured in millions of instructions per second (MIPS). The fastest U.S. systems on the market through mid-1990 had processing speeds of around 120 MIPS. However, leading U.S. companies began introducing new families of computers in the third quarter that offered approximately twice this performance in six to eight processor configurations. Two Japanese suppliers announced new mainframe lines with high-end multiprocessor models that will reportedly operate at 500 MIPS; these will be shipped in 1991.

Mainframes achieve their high speeds through advanced computer design; high-density packaging; and very large scale integration (VLSI) emitter coupled logic (ECL) chips. The cycle time of several systems is now down to 10 nanoseconds. Their main memory capacity is considerably larger than other types of commercial computers; it can reach up to two billion bytes (gigabytes) through the use of the latest dynamic and static random access memory (DRAM and SRAM) devices. Mainframes can be either air or water cooled. The cost of research and development for a new generation system averages about $500 million, but can reach as high as $1 billion.

INTERNATIONAL COMPETITIVENESS

Competitors in the mainframe market fall into one of two camps: IBM, and U.S. and foreign manufacturers of

IBM compatible mainframes and peripherals, representing the majority of the market; and others offering machines running their own proprietary operating systems. Beginning in late 1989, the number of proprietary mainframe firms grew with the entry of Digital Equipment Corporation, Hewlett Packard, and Tandem, all U.S. companies, from the U.S. midrange computer market. Mainframe suppliers also faced increased competition from producers of such smaller systems, offering similar performance capabilities at lower cost, such as scalable parallel computers built from hundreds of microprocessors, and networked workstations and personal computers.

Japanese companies have used acquisitions to expand their presence in the U.S. and European mainframe markets. Hitachi established Hitachi Data Systems, a new U.S. joint venture with a General Motors subsidiary, after purchasing 80 percent of National Advanced Systems, its former U.S. distributor. Fujitsu in mid-1990 acquired control of ICL, the United Kingdom's leading mainframe computer manufacturer. The purchase will reportedly give the Japanese firm significant distribution channels in Western Europe and Eastern Bloc nations, and provide access to major European R&D efforts such as ESPRIT, a broad European high-technology program concerned with products, prototypes, and standards.

Demand for mainframes remained sluggish in 1990. U.S.-based shipments rose only 2 percent to an estimated $13 billion. Some buyers looking for upgrades to their systems deferred purchases in anticipation of new mainframes announced in the second half of the year for delivery in 1991. Other users did not need additional processing capacity. Consultant studies of corporate and federal data processing spending plans also indicated that users would continue to place a larger portion of their budgets into networking and systems smaller than mainframes.

Outlook for 1991

Mainframe shipments by U.S.-based manufacturers should increase by 3 percent in 1991, to $13.4 billion. Domestic demand is expected to increase by midyear, when the new generation systems are delivered. Although foreign demand should grow at a slightly higher rate than domestic, much of it will continue to be served by the manufacturing operations of U.S. companies in Western Europe and the Far East.

Long-Term Prospects

Mainframe vendors may experience a resurgence in demand for their systems beginning in 1992, benefitting from the trend toward "enterprise-wide" computing within major corporations. Large scale mainframes will not only continue to play a significant role in on-line transaction processing, but will also handle massive data bases and manage complex networks of workstations and personal computers. If vendor efforts in software and networking technology bear fruit, processors and storage devices will reside in different geographical locations within an enterprise and be linked together by very high-speed fiber optic channels. Corporate mainframe users will have access to all of these computing and storage resources which will appear to the user to be a single computing system.—*Tim Miles, Office of Computers and Business Equipment, (202) 377-2990, September 1990.*

MIDRANGE COMPUTERS

The midrange segment of the computer industry consists of multiuser systems, ranging in price from $25,000 to $500,000, with 16- to 64-bit processors. Some of these machines are designated general-purpose computers; others are designed for specific applications. Midrange computers serve a broad spectrum of applications, but are used predominately in services and durable goods manufacturing, and to a lesser degree, in the education and government markets.

The midrange market remained at approximately $20 billion in 1990. The midrange environment continues to undergo changes in its fundamental structure. Traditional midrange vendors are reducing their workforce through layoffs, early retirements, and attrition. Previous years of austerity have paid off for a number of the suppliers, who have reported significant strengthening of their financial positions. However, some midrange players continue to struggle, and an industry shake-out is likely.

Most midrange vendors have broadened their offerings to include networking equipment, software, technical workstations, portables, and system integration services. Many midrange suppliers have focused on specific market niches. Many offer their midrange computers as network servers, but competition for this application comes from the powerful new dedicated network servers described in the Local Area Networking section of this chapter. Most analysts feel that both midrange systems and dedicated network servers have their roles, due to differences in capacity and software availability.

Users of midrange systems are carefully watching the development of open systems—those employing nonproprietary or standardized hardware components and operating systems. Most suppliers, while seeking to preserve their installed base of proprietary systems, have also introduced some form of open system. Open systems have garnered a share of the midrange market, and as such limitations as the lack of specific applications software are overcome, these systems will account for an even larger share.

Open systems, which are not as profitable as proprietary systems, have made pricing in the midrange segment more competitive. Open systems also contribute to the increasing importance of value-added resellers (VARs), who bundle each system with applications software for specific user needs. In 1990, approximately 17 percent of all midrange systems were sold through VARs, compared to 11 percent in 1987. Many midrange suppliers are broadening their range of products through strategic relationships with other suppliers.

Midrange users are turning to laser-printing rather than traditional high-speed impact printers. Small- and medium-size computer users are finding the high-end of laser printers (36–79 pages per minute) well-suited to their needs for print quality, flexibility, and consistency.

Outlook for 1991

Growth of midrange systems in 1991 should remain in the 0–4 percent range, and users will continue to weigh size, price, and performance features in purchase decisions. The financial health of the traditional midrange companies should improve, due not to revenues from midrange sales, but rather to their new lines of business. Sales of open systems will slow due to the availability of more powerful proprietary systems introduced by vendors within the last two years.

Long-Term Prospects

In the long term, software will drive increases in the demand for midrange systems, particularly software that facilitates the connectivity of incompatible systems. Until this happens, open systems will continue to slowly increase their installed base, while seriously competing with proprietary systems. Midrange systems will provide functionality to large networks until dedicated network server hardware and software is developed that can handle large networks.—*Heidi M. Hoffman, Office of Computers and Business Equipment, (202) 377-2053, September 1990.*

WORKSTATIONS

Workstations are single-user computer systems with advanced graphics capabilities that, in price and performance, compete with the fastest personal computers at the low end and mini-supercomputers and superminicomputers at the high end. They have been purchased mainly for computationally intensive scientific and engineering applications since their introduction in the early 1980s, but in recent years have moved into such commercial markets as electronic publishing, business graphics, financial services, mapping, and office automation. Their most significant features are the use of high-performance, 32-bit microprocessors; large, high-resolution monochrome or color monitors; and sophisticated software capable of handling multitasking (more than one task at a time) and networking (communications with other computers). Graphics supercomputers are a class of 64-bit workstations introduced at the high end in 1988, priced around $100,000. These systems have scalar and vector processing performance levels well above traditional technical workstations and superworkstations, and graphics capabilities that enable scientists and engineers to view 3-D simulations of complex mathematical models in real time.

In contrast to the sluggishness of some segments of the computer industry, U.S. workstation vendors enjoyed another year of strong demand for their systems from both domestic and foreign customers in 1990. Their worldwide shipments reached 500,000 units valued at an estimated $8.5 billion, a 37 percent increase over 1989. U.S. suppliers stimulated demand by continuing to announce new products with substantial improvements in their price/performance ratios, and by slashing prices as much as 25 to 40 percent on selected existing entry-level and high-end systems. The battle for market share among leading manufacturers, their efforts to displace personal computers in certain commercial accounts and to stave off encroachment by X-windows terminal firms, drove the price per MIPS (millions of instructions per second) for a low-end workstation to under $400 retail and to below $240 after volume discounts. Competition across the product spectrum intensified with the entry of semiconductor houses and the introduction of a new workstation family by IBM, signaling its intent to play a major role in this market.

The rapid pace of new product introductions has reduced the product life cycle of traditional 32-bit workstations to only a year. Models introduced on the market in 1990 had at least 12 MIPS performance, a minimum of 8 megabytes (MB) of main memory, and an average of 120 MB of auxiliary storage. The majority of these new systems used reduced instruction set chip (RISC) microprocessors as their central processing units and UNIX as their operating system environment. Some workstations featured superscalar architectures in which several instructions could be executed simultaneously per clock cycle, resulting in a significant boost in system performance over competitive products. A number of suppliers marketed models with 3-dimensional graphics capabilities for under $10,000. At the high end, a graphics supercomputer system with up to 8 central processing units operating at more than 230 MIPS and with 128 MB of main memory was introduced for approximately $200,000.

Workstation vendors have begun to broaden their distribution channels in the United States to compete with high-end personal computer manufacturers. Although original equipment manufacturers (OEMs) and value-added resellers have been their principal sources for sales, U.S. firms have increasingly turned to retail dealers to lure commercial customers away from personal computers and to counteract the forays of PC suppliers into traditional workstation markets. Almost 250 dealers now distribute workstation products, according to a recent report from Summit Strategies, a Boston-based consulting group.

INTERNATIONAL COMPETITIVENESS

Japanese firms have only entered the workstation market in the past few years, and have acquired, through joint ventures, licensing agreements, and investments with technologically advanced U.S. companies, the microprocessor, application specific integrated circuit (ASIC), and software technologies they need to become competitive. Particularly noteworthy have been their licensing of high performance RISC microprocessor technology from three leading U.S. developers of these chips, and investments in two high-end workstation suppliers. The Japanese pioneered the use of gallium arsenide circuitry (an input/output random access memory) in workstations, and introduced the first laptop models during 1990 (see section on portables for a discussion of laptops).

Taiwanese and South Korean firms have emerged as potential competitors in the world workstation market by manufacturing clones of popular U.S. systems. Following the Japanese example, they hope to build strong semiconductor bases and acquire necessary hardware and software technologies through licenses and joint development projects with U.S. companies. They expect to have a substantial impact on the low end of the market, using their capabilities as high volume, low-cost producers to drive down prices. One Taiwanese firm was marketing a clone by August 1990, and at least three other Taiwanese firms were due to announce workstations by year end. Five South Korean suppliers also had systems under development.

Outlook for 1991

Workstation shipments by U.S. manufacturers should grow 30 percent in 1991, to more than $11 billion. Unit volume may reach 700,000 units. Substantial increases expected in foreign sales, particularly to Western Europe and Japan, should help to offset slower growth in domestic sales. Price competition should remain severe across the product spectrum. The list price of an entry-level system may decline nearly 25 percent to around $4,000. Performance should also continue to improve dramatically. Advances in RISC microprocessor technology could boost the peak performance of traditional 32-bit workstations to between 60 and 100 MIPS by year end.

Long-Term Prospects

The U.S. workstation industry can expect significant challenges to both its market and technological leadership over the next five years. At the low end of the market, it will face growing competition from personal computer suppliers and Asian clone manufacturers offering systems with comparable processing power, memory, and graphics capabilities. In the more advanced workstation market, U.S. manufacturers will have to contend mainly with large, vertically integrated Japanese companies which will try to win control of these markets through a 2-pronged strategy of targeting certain RISC microprocessors and versions of UNIX, and by using their manufacturing prowess in semiconductor and display technologies. The ability of U.S. firms to protect intellectual property rights, provide customers with better service and support, and keep the lead in software development, will determine whether they remain dominant in workstations. Particularly important will be their efforts to develop software that will make their machines easier to use and network together in an integrated computing environment that employs proprietary and open systems from different vendors. The world market for workstations could exceed $30 billion by 1995, if average growth rates of 30 percent per year are maintained.—*Tim Miles, Office of Computers and Business Equipment, (202) 377-2990, September 1990.*

PERSONAL COMPUTERS

Personal computers (PCs) are single-user, general application computers based on a single microprocessor chip with a resident operating system and local programming capability. Typical units with monitor sell for $2,000 to $4,000, although prices range from $500 for some home computers to $30,000 for the most sophisticated, fully-configured systems. Although high-end PCs are approaching the performance levels of low-end workstations, they typically are single task oriented and have slower processors, less graphics capability, and lower resolution displays. Personal computers include two categories, desktops and portables. Stationary desktop systems include floor-standing or "tower" configurations; portable computers include transportable, laptop, notebook and hand-held models. This section covers desktop personal computers. A separate discussion of the portables market follows this section.

The trends in the U.S. industry toward less concentration and more internationalization continued in 1990. New firms entered the U.S. PC market, while some firms lost market share. From 1985 to 1990, according to Dataquest, the share of unit shipments of the top ten vendors decreased from 80 to 56 percent. Buyer demand for standardized technology and the continued availability of off-the-shelf components and circuit boards, especially from the Far East, makes market entry easier for small firms. However, new entrants must stay competitive in service, support, and price in this increasingly commoditized industry. Foreign vendors' penetration of the U.S. market also increased. Overseas suppliers marketed their products more aggressively and purchased U.S. computer firms to obtain new technology and distribution channels. From 1985 to 1990, these companies increased their share of the U.S. market from 10 to 26 percent; this increase was driven by strong sales of laptop computers. This trend should continue over the next several years. Forty percent of the fifty largest PC vendors selling in the United States are currently foreign owned. As worldwide market competition increases, domestic and foreign suppliers will increasingly look beyond their home borders for new markets.

Shipments of desktop and portable computers to the U.S. market in 1990 exceeded 10.7 million units, up about 7 percent from 1989. These included computers manufactured and assembled in the United States by domestic firms and U.S. subsidiaries of foreign companies; and imported systems produced offshore by either U.S. or foreign-owned companies. The value of the U.S. market increased 13.6 percent to around $31.8 billion. The growth in sales was unchanged from 1989.

In 1990, there were no spectacular product or technology introductions that dramatically spurred sales, nor major changes in consumption patterns. It was another year of transition for buyers and aggressive competition and price-cutting for suppliers. The user base continued to move gradually but resolutely toward the world of 32-bit high speed processors, multi-megabyte memories and multitasking operating systems. Purchasers continued to respond as much to technical issues as to economic cycles. For example, buyer confusion over the myriad of technical and purchase options—processor type and speed, packaging style (portable versus desktop), memory and storage capacity, type of peripherals and controller boards, operating system and application software, user interface, price, distribution channel and vendor—continued unabated. This confusion, compounded by a general economic slowdown in both capital and consumer spending, contributed to sales that were below historical trends.

A breakdown of PC sales by application shows that business/professional usage represented about two-thirds of the market in 1990, in terms of units sold and value, according to the International Data Corporation (IDC). The 9 percent increase in units sold in 1990, to 6.9 million, was slightly less than 1989 growth. Unit shipments for scientific/technical and educational consumption grew 21 percent and 7 percent respectively. By contrast, sales of PCs for very limited entertainment, hobby, and home management uses (i.e. balancing checkbooks) declined 26 percent in 1990, to around 900,000 units.

As computer suppliers searched for new markets in 1990 because of the slowing of the business sector, they focused on the estimated 94 million U.S. households, which are a growing market for home business computing. Several major PC manufacturers introduced new models in the sub-$1,000 price range specifically targeting this large and unsaturated market segment. Others promoted their lowest-cost machines through mass merchandizing channels. Promotional campaigns offered reduced prices, longer warranties, bundled software, and expanded training and support packages. According to Link Resources, only 24 percent of U.S. families now own personal computers.

Sales of PCs like the Macintosh, based on Motorola's 68xxx microprocessors, held about one-tenth of the 1990 market, a 15 percent rise over the previous year. Shipments of PCs using Intel 80xx/x processor chips, which include all IBM PC-compatible computers, grew around 12 percent, and represented about 80 percent of the market. Shipments of 8088/86-based PCs—former mainstays of the market—continued the decline that began in 1986 when computers with these chips were replaced by a newer generation. However, the use of these chips in handheld portables may cause a rise in shipments after 1992.

PC-AT computers, based on the 80286 processor, accounted for a third of U.S. sales, and have dominated sales since surpassing the PC-XT in 1988. These sales may now have peaked as buyers are demanding even higher performance computers to run more complex software. But demand for 80286 processors will continue through their use in laptops and notebooks, and in other less demanding processing applications.

The new 80386sx computers, powered by a less expensive version of the 80386 microprocessor and capable of running new 32-bit software, are replacing the ATs as the predominant system in the market. Billed as the new entry-level computer for the commercial sector, shipments of these units exceeded 2 million in 1990 and surpassed sales of regular 80386dx-based computers.

Competition in 1990 continued between competing 32-bit bus technologies used to transfer information and commands among elements of a computer system. More PC models and plug-in boards were introduced that were based on the Extended Industry Standard Architecture (EISA) and the Micro Channel Architecture (MCA) buses. EISA is an extension of the current AT standard, while MCA is the new IBM standard. These new products provide more robust performance levels for data-intensive and complex communication functions, but represent only about 10 percent of the market, most of which are MCA based-computers made by IBM. Initial EISA boards have been designed for file server-type systems based on Intel's 80486 chip, and sell for over $10,000; however, the technology is expected to migrate down into the 80386 arena, with resulting price decreases. While some system and board manufacturers prefer one technology over the other, many are supporting both architectures.

As personal computers become more widely dispersed among all segments of society, the design of human interfaces becomes increasingly critical to their utility and popularity. Interface issues range from the design of such physical input devices as keyboards, point-and-click mouse devices, and light pens, to a user's mental interaction with the computer. Since the introduction of the Macintosh in 1984, its graphical user interface (GUI) has become very popular. The GUI system uses icons (symbols) to represent available functions; these icons are generally manipulated by a mouse in conjunction with a keyboard. This approach is in contrast to the more traditional method of using typed commands and character-based software, which has been characteristic of DOS and other operating systems. Such GUI software as Windows 3.0, introduced in May 1990 for the DOS environment, is increasing in popularity, and should be a key factor in making computers easier to use. More GUI-compatible applications software is being developed.

INTERNATIONAL COMPETITIVENESS

Foreign markets are becoming more important to U.S. manufacturers. In 1990, some producers sold as many PCs to the growing European and Asian markets as they did in the United States. Dataquest estimates that the European PC market grew 17 percent in 1990, to $27 billion. The business sector accounted for most of this value, while the far less developed home market represented 10 percent of sales. In general, market sophistication in Europe has lagged behind those in the United States. Shipments of PCs with Intel 8088/86 processors peaked in 1988 and are now beginning to drop rapidly, while 80286-based systems, which led the market, are also beginning to decline. As in the United States, the 80386 generation of PCs will dominate sales into the mid-1990s, growing at 28 percent a year for the next several years. In 1990, these computers accounted for about 30 percent of unit shipments. Sales in Europe of the more powerful 80486-based machines are projected to take off in 1993 or 1994.

The four largest PC markets in Europe, by units shipped, were West Germany (20 percent), the United Kingdom (20 percent), France (15 percent), and Italy (10 percent). But other markets are growing quickly. Market share among vendors varied from country to country. For example, Olivetti was the leading PC supplier in Italy, while IBM was strong in France and the United Kingdom. In West Germany, Commodore held the leading market share because of a large home computer segment and a business sector dominated by centralized, mainframe-oriented computer administrators who have resisted PCs at the office level. Future growth of PC sales in Western Europe is linked to the development of broader distribution networks in each country and to after-sales service and support by dealers.

Personal computers are not yet as widely used in Japan as in Western Europe or the United States. The PC installed base in Japan at the end of 1989 was only 7 million units, valued at $28 billion. Factors that have contributed to this limited use include skepticism about the benefits of personal computers among Japanese businessmen, limited office space, and higher prices for PC hardware and software.

Shipments of PCs made by Japanese manufacturers in Japan rose 10 percent in fiscal year 1989 (ending March 1990) to $7.6 billion. Unit volume reached 1.9 million, a 27 percent increase over fiscal 1988. The majority of these machines have Intel 80286 and 80386 microprocessor chips as central processing units. Business and scientific/technical users accounted for 81 percent and 12 percent, respectively, of total market value. Principal business applications are Japanese-language word processing and spreadsheets. However, business users have been moving toward more powerful PC platforms with larger storage capacity, more robust operating systems, and more complex applications. The home and education sectors have remained relatively small and undeveloped. Japan's public school system, for example, has lagged behind the rest of the industrialized world in the use of computers. Through March 1989, little more than one-third of its 400,000 schools had installed any type of computer. The Japanese government has developed plans and will allocate funding in the near future for computers in schools.

Domestic firms maintained their dominant position in the Japanese PC market in fiscal 1989, shipping more than 90 percent of the units and accounting for nearly 75 percent of market value. Competition was particularly intense in the low-end laptop and notebook sectors. Japanese vendors sold most of their PCs through dealer networks and retail outlets, while foreign companies relied on their own direct sales forces. Price discounting was severe, with manufacturers cutting prices up to 60 percent for distributors, who then did the same for retailers.

Outlook for 1991

PC unit shipments to the U.S. market are projected to grow 6 to 9 percent in 1991. Sales to the business sector should grow at the same rate as in 1990, as companies continue to slowly upgrade from 80286 to 32-bit 80386 environments. Sales to the education and scientific sectors, which make up about one-fifth of the market, are also expected to increase at the same rate as they did in 1990. The home market may exhibit new vitality as PC prices continue to drop and home business and telecommuting needs increase. In the past, PC sales were hurt by the success of consumer electronics and T.V. broadcasting firms in the video game and home services markets, as well as by a lack of widespread demand for home and financial management applications to supplement entertainment and hobby uses. PCs based on 80386sx/dx processors will continue to sell well, capturing over 40 percent of the market, while 80486 machine sales will remain slow due to high prices, little software written specifically for the processor, and lack of reasons to upgrade to this level.

Long-Term Prospects

The U.S. PC market may exhibit somewhat higher growth rates in 1992, as pressure to upgrade to more powerful machines intensifies. Demand should be led by the need for and availability of more powerful applications software. Migration from DOS to the OS/2 operating system by local area networks (LAN) and more sophisticated users will also increase demand for higher performance computers. However, a return to the double-digit growth rates of the past will depend upon the increased use of computers in schools and homes. Widespread use of instructional computers in schools, especially below the college level, awaits additional funding, the creation of more educational software, and the development of multimedia technologies.

Major producers expect the home market to continue to grow because of increased computer literacy and awareness, the introduction of new easier-to-use software, and the widening use of home computers for business and education. Dataquest projects that sales of home computers could reach 7.4 million by 1994. In the long term, the viability of this market will depend upon the development of relevant software programs; multimedia applications integrating audio, video, text and graphics; on-line systems providing information and personal services; and integrated home management networks that control communications, security, and energy consumption.

Another potential growth area is overseas, where future PC and workstation sales are expected to grow faster than in the United States. The compound annual growth over the next five years is projected to be 11 percent in Europe and 18 percent in Japan. PC shipments outside the United States should exceed $70 billion by 1994. As a result, U.S. firms will place more emphasis on investing abroad, and on developing and adapting products for foreign markets.

As 1992 approaches, more computer and software producers are expected to locate within the European Community (EC) to take advantage of the opportunities that this large, integrated European market will offer. By establishing plants and distribution channels in Europe, companies can better benefit from EC efforts to harmonize national standards and regulations. The European Community has an estimated installed base of 24 million PCs, about half of the U.S. total. With a population that exceeds that of the United States by more than 80 million people, the EC market has great potential.

As a result of continual advances in systems and component technology and software development, significantly more powerful, functional, and easy-to-use personal computers will be introduced over the next five years. By 1995, the performance of an average system should reach at least 50 megahertz (MHz), or 5 times what currently exists. Typical memory capacity will equal 16 megabytes (MB), and access times may fall below 60 nanoseconds with the advent of faster, 16 megabit dynamic random access memory (DRAM) chips.

Developments in systems software should result in PCs that offer multitasking and advanced networking and graphics capabilities.—*R. Clay Woods, (202) 377-3013; Maria de la Guardia, (202) 377-2053; Office of Computers and Business Equipment, September 1990.*

PORTABLES

A portable is a personal computer which has all the functions of a desktop computer; is rugged enough for travel; and has a full-sized keyboard in the same physical unit as the display, the motherboard, and some type of mass storage device.

The U.S. portable computer market was worth $5.4 billion in 1990, a 30 percent increase over 1989. The United States is the largest single market for portables, with about 50 percent of total worldwide sales. The Japanese market accounts for 18.3 percent, and the Western Europe, 19.5 percent. In Japan, shipments of portables exceeded shipments of desktop personal computers in 1990. In the United States, with its large installed base of desktop systems, portables made up only about 11 percent of all personal computers sold. In Western Europe, the figure was 7 percent. The Western European market is quite similar to the U.S. market, and except for some software changes, demands similarly configured machines.

Almost all portables for the United States market that are more powerful than those based on Intel's 8088 microprocessor are manufactured in the U.S., to avoid the 100 percent duty on Japanese portable imports resulting from the semiconductor trade sanctions imposed by the U.S. government in 1986. Most portables sold in the United

The United States is the largest single market for portable computers, with about 50 percent of total worldwide sales. The U.S. market is forecast to grow 48 percent, to around $8 billion, in 1991.

States are assembled in the United States using foreign, primarily Japanese, components. Both Japanese and U.S. companies have recently built or acquired facilities in Europe to take advantage of the rapidly growing EC92 market.

As in previous years, portables continue to find their strongest market among professional users. Although portable computers can have all the functionality of a desktop computer, most are used only as a second computer which is periodically downloaded onto a desktop or larger system for integration into master files. But even limited to these functions, portables have become indispensable to many firms, which have expanded their technical staff to support the fleet of portables, update their communication capabilities, and provide maintenance and security.

The "docking station" concept, introduced by a number of portable vendors, combines a high-performance laptop with a docking station unit containing peripheral ports, additional drive slots, and expansion board slots. These systems occupy the high end of the portable spectrum, but are probably the architecture of the future, since they combine portability with maximum storage.

Portables have made an impact on the same markets as the desktop computer. Although the office/professional segment was the first to use portable technology extensively, the home and student markets grew by 20 percent from 1989 to 1990, the largest increase in any of the end-user groups. The number of users in this segment has increased sharply with the introduction of "notebook" style portables which can fit in a briefcase; use will accelerate as these systems decrease in price.

The portable workstation, or "lapstation," brings a new user group to the portable market. Introduced in 1990, these systems have the processing and storage capacity for many design and engineering functions. Although restricted due to limitations on display resolution and a dependence upon AC power, the systems enable engineers to run simulations away from the office.

Portable vendors all use similar technology and basic componentry, differentiating their systems by industrial design, power supply, and display functionality. Theoretically, all components are available to any portable designer. However, the most advanced displays are available in very limited quantities due to low yields in the manufacturing process.

Some specific technologies that are imperative to the success of the portable computer in the marketplace are those that decrease weight to the 4–8 pound range, extend operating time up to 8 hours on battery power, and give optimum display resolution.

Advanced displays meet many of the visual and interactive needs of the users. Even the newest flat-panel displays for portables, however, are not equal in quality or price with the cathode ray tube (CRT). The active matrix liquid crystal display (LCD) technology, which is the closest in resolution, color, and brightness to the CRT, was introduced to the U.S. market in the Apple Macintosh portable in 1990. The display is somewhat cost-prohibitive at this time due to low yields in the manufacturing process.

Such slightly older, passive LCD technologies as twisted, double-twisted and super double-twisted nematic, are available in large quantities, since they have advanced along the manufacturing learning curve. The addition of a backlight has dramatically improved the quality of these screens, although many portable vendors have chosen not to incorporate a backlight in order to preserve battery life. Color and gray-scale displays will be available on portables in early 1991, at a premium price.

Promising advances in plasma and electroluminescent flat-panel displays give vendors an alternative to LCD technology. Both these technologies now have sufficient brightness and resolution, and are advancing in the areas of power usage and color capabilities.

Power management techniques continue to be developed for maximizing battery life and extending true portability. One promising new development in batteries is nickel hydride, slated to replace the dominant nickel cadmium. Some of the advantages of the nickel hydride cell are quick charge, a favorable discharge curve, and weight 30 to 40 percent less than a nickel cadmium battery.

Until an alternative technology is developed, the keyboard remains a hurdle to further miniaturization. One step toward miniaturization is an alternative input device called the "electronic tablet," which can recognize characters written on the screen. This has already been accepted in the Japanese market, where the characters are more formalized and easier for a computer to recognize than Western script. A number of portables incorporate pointing mechanisms for data manipulation—either a roll ball or a pointing bar somewhere on the keypad. With the wider usage of the Windows 3.0 program in MS-DOS-based computers, demand for these pointing methods or touch screens will grow. Voice recognition, which currently hosts with a 30,000 word capacity, is another alternative to the keyboard.

Modem and FAX boards, common in desktop computers, are now available in portables. A number of companies have included cellular capability in their latest offerings.

Outlook for 1991

The portable computer market is one of the most exciting areas of the computer industry. Demand for portables will continue to be strong, especially in the notebook segment. The U.S. market is forecast to grow 48 percent to around $8 billion. Color displays, new power management techniques, and additional applications for the electronic tablet with stylus, will also become commercially available. All end-user segments will see healthy growth, especially the home and student markets. High-end business sales also will continue to be strong.

Long-Term Prospects

Within the next five years, voice recognition will be introduced in portables, redefining their size and shape. Powerful communication capacities will be added in the search for true portability. Battery size, weight, and strength will be other hurdles crossed in expanding portable functionality by 1996. By 1994, an equal number of portable and desktop computers will be sold in the United States. Annual growth is expected to remain around 25 percent for the next five years.—*Heidi M. Hoffman, Office of Computers and Business Equipment, (202) 377-2053, September 1990.*

MAGNETIC AND OPTICAL DISK STORAGE

Major U.S. disk storage manufacturers made significant mergers, acquisitions, and consolidations in 1990. Optimem, a disk drive and media manufacturer, was acquired by Archive Corporation; the acquisition enabled Optimem to revive its discontinued optical products. Other consolidations included Western Digital Corporation's purchase of Tandon's disk storage operation, and Maxtor's acquisition of Miniscibe, a manufacturer of rigid disk drives. Several other financially troubled U.S. disk storage manufacturers were unable to find "white knights" to rescue them. For example, Priam, known for its high-capacity, high-performance 5.25-inch drives, went into Chapter 11 bankruptcy, and its operations were sold separately to several companies.

Total employment in the U.S.-based disk storage industry declined an estimated 10 percent from 1989 to 1990, to 31,000 units. The decline was due to several corporate failures and to the continued expansion of offshore production.

End users continued to demand increased capacity and lower prices. Dataquest estimates that the average capacity for 3.5-inch magnetic disk drives nearly doubled from 1989 to 1990, to 80 megabytes. The 5.25-inch drives increased to over 200 megabytes compared to 126 megabytes in 1989. The highest capacities for both 3.5-inch and 5.25-inch were offered by Seagate Technology, 426 megabytes and 1.2 gigabytes, respectively. As the storage capacity increased, the factory cost per megabyte dropped between 1989 and 1990 from $3.96 to $3.11 for 5.25-inch disks, and from $5.86 to $4.65 for 3.5-inch disk form factors.

The trend toward miniaturization and higher capacity in disk storage continued in 1990. According to the Disk/Trend Report, worldwide sales of 3.5-inch drives with capacities of 300–500 megabytes increased nearly tenfold, from 40,000 units in 1989 to 373,000 units in 1990. Sales of 5.25-inch drives with capacities of 500 megabytes-1 gigabyte increased 203 percent, from 158,000 to 480,000 units.

The 3.5-inch form factor drives accounted for 71 percent of all rigid disk drive shipments, followed by 5.25-inch at 23 percent, and less-than-3-inch disk drives at 2 percent. Larger form factors, 8- to 10-inch drives and 14-inch drives, each accounted for only 1 percent of total shipments.

While shipments of 3.5-inch drives showed a healthy increase due to increased market demand for 3.5-inch drives by desktop and laptop owners, the 5.25-inch segment of the storage industry dropped significantly. In 1990, 19 million units of 3.5-inch units were shipped, an increase of 44 percent over 1989. By comparison, shipments of 5.25-inch drives were 4.8 million units, a sharp decline of 31 percent from the previous year. The increased sales of 3.5-inch drives boosted revenues for U.S. manufacturers, as over 90 percent of revenues generated from the sales of these devices went to U.S. firms.

About 500,000 2.5-inch drives, which first entered the commercial markets in 1989, were sold in the United States in 1990. The average capacity of these drives was 30 megabytes. Two U.S. companies, Conner Peripherals and PrairieTec, and one Japanese firm, JVC, dominated the 2.5-inch drive market. Substantial growth in the demand for notebook-size personal computers (weighing less than seven pounds) also motivated several other companies, including Areal Technology and Quantum, to begin manufacturing the 2.5-inch disk drive in 1990.

INTERNATIONAL COOPERATION

Several alliances were formed between Japanese companies and U.S. disk storage firms to manufacture state-of-the-art disk storage products, in the form of either joint ventures or acquisitions. In 1990, Mitsubishi/Kasei acquired Verbatim, a leading floppy disk manufacturer, from Eastman Kodak, and announced product developments in 3.5-inch magneto-optical media. Maxoptix, a joint venture between Maxtor, a leading U.S. manufacturer of 3.5-inch and 5.25-inch magnetic disk drives, and Kubota Ltd, a Japanese company, produced and commercialized erasable (rewritable) disk drives. The company's 5.25-inch optical disk drive, Tahiti, has an average seek time of 35 milliseconds, the fastest in the industry.

Several manufacturers shipped significant numbers of 5.25-inch erasable optical drives in 1990, including such Japanese companies as Sony, Ricoh, Canon and Masushita Electric. Mass Optical Storage Technologies, a subsidiary of Nakamichi Corporation, announced volume production of 128 megabyte, 3.5-inch diameter, rewritable drives. Total worldwide shipments of erasable optical drives were estimated to have reached 150,000 units, worth $373 million, in 1990.

The optical drive industry also introduced an advanced phase change recording technology for erasable drives in 1990. This type of technology allows the media to interchange between write-once and erasable on a single drive. Other advances were higher capacities and faster access times, equivalent to today's small form factor magnetic drives; these pose the best possibility of displacing magnetic drives in the marketplace. The current price/performance ratio of erasable optical drives, however, makes them uncompetitive with magnetic drives for the present.

Outlook for 1991

The explosion in the market for laptops and notebook-size personal computers will significantly boost the demand for smaller drives. In 1991, worldwide shipments of 3.5-inch drives are expected to rise 24 percent to $24 million, and 2.5-inch drives will show a sharp rise of 179 percent, to over 1 million units. Unit shipments of 5.25-inch hard disk drives are forecast to drop 25 percent to 3.6 million units. In the near future, optical drives will complement high performance magnetic disk drives. Cost of optical drives will remain substantially higher than magnetic drives in the near future. Increased sales of 3.5-inch optical drives are anticipated when IBM introduces its version of the device to the marketplace in late 1990. Average access time for 5.25-inch drives is expected to decline to 30 milliseconds, and to 25 to 30 milliseconds for 3.5-inch optical drives.

Long-Term Prospects

Capacities for all form factors will continue to increase. By the mid-1990s, the average capacity for 5.25-inch drives should climb to over 900 megabytes, and for 3.5-inch drives to about 140 megabytes. Consolidation of U.S. disk drive vendors may continue. The market for 5.25-inch disk drives should continue to decline. Competing technologies like 2.5-inch disk drives and erasable optical disk drives are expected to enter the mainstream market for portables and desktop computers. Several critical technologies including dye-based media—which uses less expensive materials such as a dissolvable coating on media—should migrate from R&D status to practical applications in the erasable optical disk drive industry. This should improve the cost/performance of erasable drives, making them serious contenders for displacing high capacity magnetic drives by mid-1990.—*Victoria Kader, Office of Computers and Business Equipment, (202) 377-0571, September 1990.*

PRINTER INDUSTRY

The U.S. printer market was valued at $11 billion if-sold-value (list price times number of units sold) in 1990, an increase of nearly 7 percent over 1989, according to BIS CAP International, a market research and consulting company. Virtually all 1990 growth in the printer industry stems from the nonimpact printer segment, which grew almost 20 percent above 1989, to $6 billion. The shift to ink jet and laser technology, which began in the mid-1980s, continued due to falling prices and to increased demand for desktop publishing and high quality copies. Desktop laser printers accounted for more than 60 percent of the total value in the non-impact category.

BIS CAP International estimates that the color segment of the non-impact printer market, which appeals to selective industries such as publishing, totaled only $5 million in 1990, representing 45 percent growth over 1989. Although ink jet color printers accounted for more than 71 percent of unit shipments in this category in 1990, thermal transfer color printers supplied nearly half the value. The average price of an ink jet color printer was about $2,750, compared to $7,500 for a thermal transfer color printer, which produces copies with better resolution and deeper, richer colors. Progress in color laser technology is slow. Aside from the enormous costs, the single greatest obstacle is the difficulty in achieving precise color placement. Recent breakthroughs allow some intelligent color copiers, with the proper software and add-on components, to be transformed into color laser printers. The main add-on component, known as the intelligent processing unit (IPU), functions as the connection between the computer and the copier. Converting an intelligent color copier into a color laser printer can cost anywhere from $30,000 to $100,000, depending on the configuration and the specific needs of the user.

Dataquest, a market research firm, reported that shipments of impact printers totaled about 5.3 million units in 1990, representing a decline of almost 5 percent over the 1989 level. Dot matrix printers accounted for almost 98 percent of all impact printers sold. Although non-impact printers are the fastest growing segment of the printer industry, impact printers still account for 29 million units or almost 80 percent of the U.S. installed-base.

Outlook for 1991

The U.S. printer market is expected to reach nearly $12 billion in 1991. The non-impact market will continue to dominate, and is expected to reach nearly $7.5 billion. Laser printers with 7–19 pages per minute (ppm) capabilities will account for the greatest growth in value. However, as prices for laser printers operating at less than 6 ppm continue to fall and new product lines are introduced, unit shipments of these printers are expected to increase by about 29 percent. The value of color printers should grow by more than 60 percent and could exceed 200,000 units. Ink jet technology will continue to lead growth in the color segment. Expansion in the color laser market will be held down by high prices and other competing technologies. Because of the shift to laser technology, the value of shipments of impact printers are expected to drop nearly 7 percent in 1991.

Long-Term Prospects

New product developments will continue to shape the printer industry. Through 1996, laser technology will be preferred in the monochrome segment, and laser revenues will rise 12 to 17 percent annually. In the color segment, ink jet technology will dominate the market. Shipments of impact printers are expected to drop below 3 million units, but will still represent 50 to 60 percent of the U.S. installed base over the next five years.—*Maria de la Guardia, Office of Computers and Business Equipment, (202) 377-2053, September 1990.*

LOCAL AREA NETWORKING

The local area network (LAN) market has continued to expand since the early 1980s as user needs have become more sophisticated. LANs allow users to share such expensive resources as storage devices and peripherals, while providing efficiency, database integrity, and security. LANs, once predominantly found on the departmental level, are now working their way into the management information systems (MIS) level and becoming part of enterprise-wide networks. They are becoming the preferred platform for such corporate mission critical applications as on-line transaction processing and computer integrated manufacturing.

The worldwide LAN market grew by 25.5 percent in 1990, reaching $6.4 billion, according to Dataquest. (These numbers are for hardware excluding both gateways and LAN software applications). The U.S. market share was $2.6 billion. Among the major worldwide market segments are PC LANs and enterprise LANs. The PC LAN segment, including network operating systems (NOS), dedicated servers (hardware designed to run network-oriented operating systems and server-based applications), and network interface cards (NIC), grew by 32.5 percent to $4.4 billion. Revenues in the enterprise LAN segment, which includes LAN interconnects (bridges and routers), terminal servers, host-based boards, and wiring centers, grew by 12 percent to $2 billion. Areas experiencing major growth in 1990 include NOS, dedicated servers, LAN interconnects, and unshielded-twisted pair connections.

The worldwide LAN network operating systems market is estimated at $1.2 billion for 1990, according to a report by Salomon Brothers. Major NOS vendors include Novell, with approximately 55 percent of the market, 3Com with 13 percent, IBM with 12 percent, Banyan with 6 percent, and Apple with 3 percent. NOS vendors, responding to the need for connectivity between different protocols, are supporting such open standards as Open Systems Interconnection (OSI), and delivering software for each other's proprietary protocols.

The market for dedicated LAN servers grew by 70.7 percent in 1990, to $542.8 million, according to Dataquest. Server vendors are introducing a new generation of network servers capable of handling more users and more traffic, and performing other tasks beyond the simple activities of file transfer and peripheral sharing. The market is being driven by the sheer number of PCs and workstations on networks, and by the trend toward client-server computing (where processing of an application is split between the front-end PC or workstation and the back-end server.) The new Intel 386 and 486 microprocessor based servers can provide peak internal transfers at speeds comparable to many mainframes.

The market for network interface cards (NIC) grew by 22.3 percent in 1990, reaching $2.5 billion. Close to 4.0 million NICs were shipped to the U.S. market. More than 45 percent of NIC shipments in the United States are based on Ethernet; in 1990, these shipments of NICs running on Ethernet totaled about 1.8 million units. Ethernet should remain in fairly strong demand with the advent of the 10Base-T standard, which allows Ethernet LANs to transmit at 10 megabits per second (mbps) across standard unshielded twisted-pair wiring. The 10Base-T hardware market reached $460 million in 1990 and will experience a compound annual growth rate of 21.9 percent between 1989 and 1996, according to Market Intelligence Research Corporation (MIRC). Token ring connections are on the rise, comprising about 30 percent of units shipped to the market in 1990.

Unshielded-twisted pair (UTP), a common telephone-type wire, is becoming the media of choice for Ethernet connections. UTP connections for Ethernet tripled between 1989 and 1990, and now make up close to 35 percent of the total quantity of Ethernet NIC shipments. The ability to use already installed telephone wire for connecting LANs is one reason for this rapid growth in UTP connections. Shipments of NICs over fiber optic connections for Ethernet doubled in 1990, yet make up only 2 percent of the total quantity of Ethernet NIC shipments. Coaxial cable connections make up the remaining 63 percent of Ethernet NIC shipments.

Corporate executives see LANs as valuable assets, and are demanding total enterprise connectivity and control. As the market for enterprise networks increases, so does the demand for such internetwork devices as gateways, routers, and bridges. In 1990 the worldwide LAN interconnect market grew to $562 million, about 10 percent of total LAN revenues, according to Dataquest. (This number excludes gateways). The sale of remote bridges, which link geographically separate LANs over telecommunication lines, grew 37.7 percent over the 1989 level, reaching $207 million. The sale of routers, which selectively forward data from different protocols, grew to $226 million, a 47 percent increase over 1989. End users are interested in moving toward enterprise-wide networking and maintaining their already existing installed base of computers. With the trend toward connectivity, the market for gateways has increased. Gateways connect users of different computer architectures, allowing access to other LANs, minicomputers, mainframes, LAN facsimiles, and electronic mail (e-mail) systems.

The trend toward enterprise-wide networking has fueled rapid growth of wiring hubs, which combine different topologies (configurations) and media into one concentrator. Until recently, most wiring hubs were media-distribution systems providing connectivity between fiber, twisted pair, and coaxial cables for Ethernet. "Smart hubs" have now evolved, which are sophisticated architectures handling such multiple access methods as Ethernet, token ring, and fiber distributed data interface (FDDI), under a common system of management and control. The worldwide market for wiring centers in 1990 reached $495 million.

In 1990, more software applications were introduced to enable users to reap the benefits of network computing. In the early days of LANs, existing single-user software was simply modified to run on a LAN. Now software is being designed to take advantage of the distributed processing capabilities of a local area network, allowing several workstations to access and use the same data files at the same time. Some popular LAN software applications are database management, accounting, E-mail and text processing. The total LAN application software market was about $681 million in 1990, according to International Data Corporation (IDC). The PC LAN E-mail market is growing, but only 14 percent of all PC LAN users in 1989 had access to an E-mail package.

An important area of interest in 1990 was network management software, which, unlike other networking software packages, is designed exclusively to assist the network manager in controlling the activities of the network. There are currently a number of competing architectures for network management; there is also an industry-wide effort to standardize network management protocols. The network protocol used by most managers is called simple network management protocol (SNMP), which runs on transmission control protocol/internet protocol (TCP/IP) networks. Many other managers use common management information protocol (CMIP), which runs on open systems interconnect (OSI) networks. U.S. vendor sales of integrated network management systems more than doubled over their 1989 level, to $75 million in 1990.

Distribution channel revenues for LANs have shifted toward non-direct channels. According to *LAN Magazine*, the LAN value-added reseller market is growing at 40 percent a year, with combined sales of the top LAN suppliers surpassing $1 billion in 1990. The LAN VAR industry is experiencing consolidation as smaller VARs are acquired by larger ones. This is in direct response to changes in the end user environment, where MIS (management information systems) managers are becoming more involved in the LAN buying decisions of large corporations, and are buying from dealers who have greater resources.

In 1990, major vendors announced their commitment to OSI as a key component of enterprise networking. Governments and corporations in the U.S. and abroad are now taking steps to incorporate this network protocol into their existing systems. For example, the U.S. Government has implemented the U.S. Government OSI Profile (GOSIP). The GOSIP mandate, which came into effect August 15, 1990, requires federal agencies to purchase only network products complying with OSI standard specifications. Although OSI is part of the strategic planning of many network users since it allows for more open connectivity, the lack of OSI applications and the established success of TCP/IP applications hinder OSI growth. Consequently, TCP/IP continues to grow.

FDDI technology is gaining acceptance for corporate backbone networks because of its 100 mbps data transfer rate, low noise level, and advanced network management capabilities. More than 80 leading computer and telecommunications companies support FDDI products. A second generation of FDDI chips was introduced in 1990. These new chips offer improved integration and network management support.

INTERNATIONAL COMPETITIVENESS

The international market for LANs is rapidly expanding. LAN vendors are looking abroad for sales as the market in the U.S. slowly becomes saturated. Foreign purchases of U.S. LAN products reached an estimated $3 billion in 1990, excluding revenues of host-based boards and wiring centers. The markets in France, Spain, and Italy are now in early development, with prospects for substantial growth. The Japanese computer market is still dominated by minicomputers and mainframes, and some analysts estimate that LANS will not take hold in Japan for three or four years. However, headway has been made by U.S. LAN vendors specializing in enterprise-wide LANs. Interestingly, the Japanese have made advances in developing FDDI applications running at 100 mbps over fiber optic cables.

Outlook for 1991

The total worldwide LAN market will continue to grow through 1991, reaching $8.1 billion, a 27 percent increase over 1990, according to Dataquest. The PC LAN market alone is expected to grow to $5.8 billion, a 32 percent increase. Leading the growth in the PC LAN segment are dedicated servers, which will grow an estimated 70 percent. Growth in the enterprise LAN market is being spurred by LAN interconnect devices. The total enterprise LAN market will grow to $2.3 billion, a 15 percent increase.

As client-server networking takes off, companies will continue to introduce products for the new generation of LAN servers. Vendors will also offer more OSI and FDDI products conforming to current and emerging standards. Users will see the introduction of a host of FDDI products, including interface cards permitting workstations to connect directly to FDDI, routers and bridges, and network management software.

Long-Term Prospects

The 1990s will see the evolution of "network computing," a phrase describing the trend in which workgroup LANs become integrated into enterprise-wide, multivendor networks. This trend will lead to real distributed processing and client-server computing used for mission critical applications.

The demand for dedicated servers, which are key in client-server computing, will rise as users move away from non-dedicated, minicomputer and mainframe servers. Client-server applications such as database management systems will also proliferate. Once the number of application servers increases, vendors will produce tools to help managers deal with client-server applications.

The market will continue to determine which standards are eventually accepted. FDDI products will increase. Infonetics Research Institute predicts that the FDDI market will reach over $1.3 billion in 1993. OSI products will continue to appear on the market, competing alongside TCP/IP products. Network management platforms will make a transition into SNMP and CMIP. As the market accepts standards, one of the main challenges will be the integration, sale, and servicing of these multivendor solutions.—*Vivian Spathopoulos, Office of Computers and Business Equipment, (202) 377-0572, September 1990.*

SOFTWARE

The U.S. software industry remained the world leader and experienced relatively healthy growth, attaining sales of almost $29 billion, or 20 percent above its 1989 level. Software markets continued to be healthy overall, with new product announcements across the range of computer system sizes, from micro to mainframe. According to International Data Corporation, the total world market for packaged software reached $43.0 billion in 1990. Of this total, the United States market represented $18.0 billion, or 42 percent. The European market stood at $17.3 billion, or 40 percent. In Japan, where custom software still represents a major percentage of that market, the packaged software market reached only $3.9 billion, or 9 percent of the world total.

In the personal computer segment of the market, Microsoft announced Windows 3.0, a graphical user interface, which works with the popular DOS operating system from the same company. The use of Microsoft's multitasking operating system, OS/2, continued to spread, although more slowly than most forecasters had predicted. Microsoft and IBM announced an agreement by which certain aspects of the future development of OS/2 will be divided between the two companies. The agreement was designed to speed the use of the operating system throughout the various segments of the personal computer market.

Operating systems for personal computers are often categorized hierarchically by their ability to handle users and tasks concurrently. The DOS operating system is single-user; OS/2, single-user, multi-tasking; and UNIX, from AT&T, is multi-user, multi-tasking. UNIX continued to be the operating system of choice in scientific and engineering applications, with its move into the business and communications markets continuing. Estimates placed UNIX at 10 to 12 percent of the market and DOS/OS/2 at about 25 to 30 percent. Proprietary operating systems such as Apple Computer Corporation's operating system for its MacIntosh line of personal computers represented 5 to 10 percent of the market.

In the larger computer systems sectors, new hardware announcements were accompanied by significant new software announcements. Both enhanced proprietary operating systems and so-called open systems, based on UNIX, formed the core of the new software products.

INTERNATIONAL COMPETITIVENESS

Intellectual property rights protection continued to be of concern to software suppliers worldwide. The European Community's Software Directive, arising from the move toward economic integration under EC92, raised the issues of copyright protection of software interfaces and the unauthorized decompilation of these interfaces in the course of "reverse engineering" efforts by competitors. By late 1990, the issues remained unresolved, although the U.S. Government had expressed its desire to the EC Commission that the two issues be resolved in such a manner as to ensure continued growth in the world's software industry.

Outlook for 1991

The U.S. software industry should continue its historical growth of about 20 percent a year, rising in 1991 to almost $35 billion. The world market should reach about $50 billion, growing 17 percent over 1990, based on International Data Corporation's statistics.

Long-Term Prospects

By 1995 the world packaged software market could approach $100 billion, with the U.S. and European markets in the forefront. The Japanese market should also show significant growth, due to the increasing competitiveness of Japanese suppliers and the continued shift of users toward packaged solutions and away from custom software.—*Heidi Hijikata, Office of Computers and Business Equipment, (202) 377-0572, September, 1990.*

ARTIFICIAL INTELLIGENCE

As the commercialization of artificial intelligence (AI) technology entered its second decade, sales of AI products reached $848 million in 1990, according to *AI Trends*, an annual industry report. The most sought after AI technologies in 1990 were expert systems, neural networks, and machine translation. Expert systems, the most visible segment of AI, are computer systems that function at or close to the level of human expert knowledge. The dominant trend for vendors was to develop and deliver expert systems that run on mainstream hardware, such as PCs, workstations, mainframes, and minicomputers.

Vendors sold 40,000 units of PC-based expert systems tools, the software programs that simplify the work of building expert sytems. These included 4500 units of VAX and UNIX workstation-based tools, and 400 mainframe-based tools, according to *Expert Systems Strategies*, an industry newsletter. Sales of expert systems tools reached $109 million in 1990, increasing 35 percent from the 1989 level.

Expert systems became more visible in business applications. A major U.S. company built a central expert system that performed on-line diagnoses of steam-turbine generators for its electric utility customers. The system served several companies, saving considerable costs. Without that system, each company would have had to build its own expert system for its individual sites.

In the services area, a consulting firm developed an expert system based tax service for nonprofit organizations, to alert tax professionals to planning opportunities and deadlines. U.S. railroad companies increased their use of expert systems to optimize the efficiency of their routing system, crew scheduling, and freight monitoring. Expert systems are also increasingly used in the financial services sector to assess financial risks associated with loans and credit cards.

The manufacturing and services industries accounted for 52 percent of the total U.S. expert systems commercial market in 1990. According to *Expert Systems Strategies* newsletter, the Defense Department and other U.S. government agencies accounted for 24 percent; and transportation, communications, and retail businesses together accounted for 11 percent. Educational and corporate R&D use accounted for 8 percent and 5 percent, respectively.

C language became the most accepted programming environment among AI developers in 1990, due largely to the successful marketing of two C-based expert systems, Nexepert and Kappa PC. Another expert systems tool written in C language is Nextpert Object, which continuously monitors system faults and determines corrective actions.

Several AI companies became involved in joint R&D projects to merge expert systems and neural network software technologies. The integration of expert systems and neural networks allows each technology to function separately, taking on the tasks it does best in solving a problem. A complete solution is achieved when the functions of these two technologies are combined.

Increased demand in the private and government sectors for character recognition, signature verification, and fingerprint identification has led several companies to develop pattern recognition systems using neural network technology. Capitalizing on this market, Hecht-Nielsen Neurocomputers, a U.S. neural network company, developed a character recognition system, IDEPT, which is used to process standard business loans. Another U.S. neural network company, Science Applications International Corporation, was awarded a contract by the Defense Advanced Research Project Agency (DARPA) in 1990 for a 28-month program to develop neural chips which are expected to form neural-based pattern recognition systems when they are interconnected.

In the beginning of this program, DARPA devoted most of its research to developing neural network software. Officials at DARPA announced later in the year, however, that the agency will now focus on developing hardware tailored to determine the advantages of neural network software.

Targeted applications include speech recognition and signal detection.

The development and application of Japanese-to-English machine translation systems has stirred considerable interest in the U.S. Government and the private sector. Two important factors are driving this R&D: the short supply of qualified Japanese language translators, and the vast amount of technical information available in Japanese. More than 10,000 scientific and technical journals were published in Japanese in 1990, in addition to various books, technical papers, reports, and intelligence reports.

INTERNATIONAL COMPETITIVENESS

Japan is the leader in efforts to apply and commercialize Japanese-to-English machine translation technologies. To assess these efforts, the National Science Foundation (NSF) and DARPA sent the NSF's Japan Technical Evaluation Center (JTEC) study team to visit major Japanese R&D sites in 1990; its findings and recommendations will be published in 1991. In FY 1990, the NSF also supported three U.S. machine translation projects, at a total cost of nearly $350,000. Five institutions received funding: New Mexico State University, Carnegie-Mellon University, New York University, Monmouth College, and City University of New York. The U.S.-Japan Task Force on Scientific and Technical Information within the U.S. Department of Commerce, recognizing the importance of machine translation technology, continues to provide ongoing interagency and bilateral forums for discussions of possible international cooperative projects. Systran, one of the oldest U.S. machine translation companies, continues to receive Government support for developing a Japanese language pair system.

In the private sector, in spite of the fact that manufacturing companies have increased their demand for Japanese-to-English machine translation systems, only a few U.S. companies conducted R&D in this area in 1990. IBM and DEC, in particular, are pursuing significant proprietary research.

By contrast, every major Japanese computer and electronics firm has invested considerable effort in machine translation research and development. Commercialized systems include Atlas-I and II (Fujitsu), Hicats (Hitachi), Pansee (Oki), Pivot (NEC), Parole (Matsushita), and Lute (Nippon Telegraph and Telephone). The Japanese Government is continuing its R&D funding for the most sophisticated machine translation technologies. This effort involves the Ministry of International Trade and Industry's Electrotechnical Lab; the Science and Technology Agency's Japan Information Center; Kyoto University; and the Fifth Generation Computer Systems Project.

In 1990, five U.S. companies concerned about the development of standards for AI technology jointly formed the Initiative for Managing Knowledge Assets (IMKA). The companies are Carnegie Group Inc., Digital Equipment Corporation, U.S. West, Ford Motor Company, and Texas Instruments; the AI Corporation joined IMKA later in the year. The first phase of the project is to develop a set of standards for knowledge representation, with the goal to create non-proprietary knowledge bases that can be easily integrated into existing conventional systems. These features should help expert system developers to capture and manage knowledge bases for different applications. The second phase of the project will concentrate on setting standards for reasoning with captured knowledge.

Outlook for 1991

Users will continue to demand standards in AI technology. The acceptance of IMKA's standard specifications for knowledge representation and inferencing, however, is likely to be opposed by non-participating AI vendors. Personal computers should become the favored development and delivery platform for expert systems. Particularly, management information systems will increasingly require AI technology products that can be merged with conventional information processing. Demand for expert systems in the United States remains strong.

Machine translation applications will be developed that will function on smaller computer systems. For example, IBM and Fujitsu, which have developed their machine translation systems on mainframes, are expected to provide systems that also run on less expensive workstations and personal computers. Translation bureaus, multinational corporations, and governments will continue to use mainframe-based translation systems, while medium-sized manufacturing companies and individuals will seek small-scale ones. The smaller machine translation systems are appropriate for domain specific applications, while large mainframe-based systems will serve users who require broad domain applications.

Long-Term Prospects

Applications of AI technology in finance, manufacturing, and defense-related services will continue to expand in the United States. Advances in merging of different AI technologies should result in several commercially viable products. The fusion of neural networks and fuzzy logic, for example, should give computer systems learning capabilities that simulate the vagueness and uncertainty inherent in human and thought processes. The merging of expert systems and neural networks will create intelligent systems that can direct users in obtaining the relevant information and making quick decisions.

Machine translation systems will continue to improve in quality and cost effectiveness. International cooperation between the United States and Japan in R&D for Japanese language pair systems will help narrow the Japanese lead in this area of technology. As the political environment continues to change in Eastern Europe, interest in translation into English from such languages as Hungarian, Polish, and Czech will increase among U.S. exporters and policymakers. A national effort to build machine translation systems that suit the needs of U.S. users will help enhance the competitiveness of American businesses.—*Victoria Kader, Office of Computers and Business Equipment, (202) 377-0571, September 1990.*

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Telecommunications Services

Revenues from domestic telecommunications services (SIC 4812, 4813, 4822) in 1990 increased 5.3 percent in current dollars and should increase about 4.9 percent in 1991. Revenues from international services, which rose 18.4 percent in 1990, will increase about 17.9 percent in 1991.

The telecommunicatons industry includes hundreds of companies providing telephone, telex, and telegraph services, international communications, microwave communications, satellite services, cellular mobile radio services, paging, private radio services, regional and metropolitan networks, data communications, and value-added services.

Before reading this chapter, please see "How to Get the Most Out of This Book" on page one. It will clarify questions you may have concerning data collection procedures, factors affecting trade data, forecasting methodology, the use of constant dollars, the difference between industry and product data, sources and references, and the Standard Industrial Classification system (SIC). For other topics related to this chapter, see chapters 27 (Information Services), 30 (Telephone and Telegraph Equipment), and 31 (Radio Communication and Detection Equipment).

The U.S. national telecommunications network transmits local, long distance, and international text, video, and voice information. More than 2,000 companies provide public telecommunications services in the United States, switching more than 450 billion calls a year on a network linking 243 million telephones via 135 million local access lines and more than 15,689 central office switches. Each access line averages about 3,300 calls each year. Census Bureau data show that as of March 1990, 93.3 percent of the 94 million U.S. households had a telephone, up 0.3 percent from a year earlier, with 900,000 new homes added to the network.

Use of the network is increasing rapidly in the United States. Due to price decreases between 1984 and 1987, the average number of local calls per day increased from 1.11 billion to 1.50 billion, a 35.1 percent increase. Average daily long distance calls almost doubled, from 88 million to 162 million. By 1990, there were approximately 80 telephones per 100 U.S. inhabitants, compared with 63 telephones per 100 people in West Germany, 60 per 100 in France, and 53 per 100 in Japan and the United Kingdom.

Local telephone services are provided by seven Regional Bell Holding Companies (RHCs), which control 22 local Bell Operating Companies (BOCs); by GTE, United Telecom, Centel; and by more than 1,400 smaller, independent local telephone companies. Many of these local companies operate as rural cooperatives. Long distance service is provided by AT&T, MCI, US Sprint, Allnet, Litel, and about 500 smaller carriers. AT&T and the RHCs are currently subject to price regulation by the Federal Communications Commission (FCC). Local telephone service is subject to regulation by state public utility commissions.

Local carriers are usually independent from long distance companies (United Telecom/Sprint being a notable exception); through FCC-regulated exchange access services, they make facilities available to long distance carriers for interstate calls. Intrastate long distance calls are regulated by state public utility commissions. Exchange access services will generate more than $28 billion in revenues for the local telephone carriers in 1991.

During 1991, the most significant trend in market structure will be the growing number of international joint ventures and strategic alliances. In addition, the growth of

Trends and Forecasts: Telecommunications Services (SIC 4812, 4813, 4822)[1]

(in millions of dollars except as noted)

Item	1987	1988	1989[2]	1990[2]	1991[3]	Percent Change 1987–88	1988–89	1989–90	1990–91
Operating revenues									
Domestic	141,499	148,334	156,374	165,949	174,755	4.8	5.4	6.1	5.3
International	4,868	5,754	6,805	8,012	9,484	18.2	18.3	17.7	18.4
Operating revenues (1987$)									
Domestic	129,422	132,128	139,032	145,716	155,197	2.0	5.2	4.8	6.5
Total employment (000)[4]	914.2	907.5	890.7	892.6	889.3	–0.7	–1.9	0.2	–0.4
Production workers (000)	676.2	667.7	639.1	640.9	635.9	–1.3	–4.3	0.3	–0.8
Average hourly earnings ($)	13.41	13.65	14.14	14.34	15.18	1.7	3.6	1.4	5.8
No. of telephones (000)	220,000	228,000	235,980	243,400	249,800	3.6	3.5	3.1	2.7
Industry price index (domestic)[5]	100.0	101.5	103.3	105.7	104.9	1.5	1.7	2.4	–0.8

[1] Includes AT&T, BOCs, cellular, independents, OCCs, radiotelephone, VANs, telex and telegraph.

[2] Estimate.

[3] Forecast.

[4] Includes telephone and telegraph workers.

[5] Index based on PPI (1987=100).

SOURCE: U.S. Department of Commerce: Bureau of the Census, Bureau of Economic Analysis, and International Trade Administration (ITA); Department of Labor, Bureau of Labor Statistics; Federal Communications Commission. Estimates and forecasts by ITA.

private corporate networks, operated by corporations for internal communications, will accelerate. The distinction between private and public telecommunications markets is eroding as regulatory constraints lessen and as technology allows for virtual networks that appear to be controlled by customers but are based on common-carrier networks. Many corporate customers can no longer justify wholly private bypass networks with facilities totally independent from the public network. Instead, large businesses will look for hybrid solutions, mixing public and private networks and applications. An economic slowdown may cause many corporations to cut costs by reducing the rate of growth of their telecommunications budgets. Corporate networks will, however, continue to be a growing market for telecommunications services. In 1991, for example, Ford Motor Company will continue expanding its already huge network to cover five continents, and AT&T will begin providing Pan American Airlines with services worldwide. In line with the growth of private corporate networks, telephone carriers will introduce even more sophisticated network management services, such as U.S. West's "self-healing" services, introduced in 1990, which ensure that such networks do not fail.

Global connectivity is the major force driving international alliances such as the service agreements between AT&T and KDD of Japan. More users are demanding access to sophisticated services on a worldwide basis, and telephone carriers in Europe, Japan, and North America are moving to address user needs for data connectivity. U.S. companies are focusing increasingly on the services markets in Europe as the European Community (EC) integrates its members' telecommunications policies and markets.

EC92 is the merger of 12 Western European countries, which constitute a single market of 325 million people with a Gross Domestic Product of $4.5 trillion and a per capita income of $13,770 in 1988. Although not expecting to be fully operational until 1992, the EC member countries are already gearing up for competition with other world markets, with telecommunications services and equipment a major component of EC plans. For equipment, see chapters 30 (Telephone and Telegraph Equipment) and 31 (Radio Communication and Detection Equipment). U.S. companies like IBM and Motorola are already involved in EC telecommunications markets, particularly for data communications and mobile radio services. Opportunities for other U.S. companies to increase their participation in the EC service markets are likely to increase as a result of EC market liberalization and reforms.

Telephone carriers will meet the demand for data communications and connectivity in part through services based on the integrated services digital network (ISDN). During 1990, ISDN services were deployed to roughly 150 corporate customers in the United States, and service will expand slowly during 1991. FCC data show that there were more than 6,100 ISDN "D" channel circuits in the United States by 1990. Many ISDN users have been able to save 20 percent on telecommunications costs as they are able to consolidate leased line services, eliminate expensive rewiring problems, and allocate channels according to demand. However, ISDN will continue to face implementation problems during 1991 because of limited availability of terminal equipment and lack of connectivity nationwide among ISDN switches. The latter problem is called the "island" configuration, whereby carriers can provide ISDN services only from a single central office switch to a local calling area, rather than on a long distance basis between switches. The island configuration results from ISDN vendor incompatibilities and software that does not yet conform precisely to international standards.

Connectivity problems may be eased as carriers finish installing software for Signalling System 7 (SS7), which will be used to provide ISDN nationwide. The SS7 is being deployed rapidly, with some local exchange carriers contracting out to independent vendors for systems integration. Bell Atlantic and BellSouth equipped about 80 percent of their access lines with SS7 by early 1991, for example; by the end of the year, Bell Atlantic expects 65 percent of its switches to be capable of providing ISDN service. US Sprint began its introduction of ISDN service in 1990, while AT&T plans to introduce ISDN to more than 110 cities by 1991. MCI will begin implementation during 1991.

Local Services

In 1990, the total value of capital investment in local exchange communications plant and equipment was about $246 billion, with the largest investment, about $85 billion, being in central office switching. Of local carriers' 135 million access lines in 1990, 17 million were used for PBX and Centrex connections, 46 million for business customers, and about 87 million for residential subscribers.

Total revenues from local exchange services were about $76 billion in 1990, and are expected to grow at a 2.9 percent annual rate during 1991. Local telephone carriers had about $2.7 billion in revenues from private line services, of which local private lines generated more than $1 billion. Voice grade private line services other than data communications brought the local carriers about $476 million in revenue, while data services constituted almost $450 million. Toll (long distance) revenues from private line service were $1.5 billion. Total toll revenues for local exchange carriers were about $16 billion in 1990, indicating that about 15 percent of all local exchange carriers' revenues are derived from intrastate long distance telephone service. For the RHCs, the figure is about 25 percent. Access charges, paid by subscribers and long distance companies to the local exchange carriers, constituted about $28 billion, or an additional 25 percent of the local exchange carriers' revenues.

In one of the most significant mergers since divestiture, GTE and Contel agreed to a $6.2 billion deal to merge their operations. The combined company, with over 17.7 million access lines, will be larger than any one of the Regional Bell Holding companies. Bell Atlantic will be the second largest exchange carrier, with 17.1 million access lines.

Long Distance Services

In the long distance, interexchange telephone service market, AT&T has about a 67.4 percent share. MCI maintained a 12.1 percent share during 1990, US Sprint holds a 8.5 share, and other carriers have about 12 percent. Long distance revenues were about $55 billion in 1990, and will rise about 8 percent during 1991. Prices for long distance service will continue to fall, while calling volume will increase about 10 percent. Access charges paid by long distance carriers for connection with local exchange networks constitute about 50 percent of a long distance company's cost structure, and contribute about 25 percent of the local exchange carriers' revenues.

The total number of interstate switched access minutes handled by all long distance carriers has grown steadily at 13 percent a year since mid-1984. AT&T's traffic has grown at a rate slower than the industry average, while the traffic handled by all other carriers has continued to grow an average of 30 percent a year. The result has been a declining market share for AT&T. AT&T's share of the overall market for interstate switched minutes has declined from over 80 percent in late 1984 to about 64 percent in the first quarter of 1990. This trend is likely to continue in 1991.

Since 1984, rapid traffic growth has been offset by sharply falling prices. As a result, toll revenues have grown more slowly than the volume of long distance calling. From 1984 through 1989, AT&T's share of toll revenues fell from 90 percent to less than 70 percent. Toll service revenues for a number of carriers are shown in Table 1.

Table 1: Total Toll Service Revenues

(in millions of dollars)

Company	1985	1986	1987	1988	1989
AT&T Communications	36,770	36,514	35,219	35,407	34,277
MCI Telecommunications	2,331	3,372	3,938	4,886	6,171
US Sprint	1,509	2,132	*2,592	3,405	4,320
Telecom*USA	201	291	396	524	713
ITT Communications Services Inc	241	282	269	282	404
Allnet	436	450	395	394	334
Advanced Telecommunications Corp	86	124	162	178	326
ALASCOM	271	267	262	272	283
Williams Telecommunications Group	—	—	—	—	282
Cable & Wireless	146	171	180	218	275
International Telecharge, Inc	—	—	—	—	275
Litel Telecommunications, Inc	—	—	—	—	197
Telesphere Network, Inc	—	—	—	—	192
National Telephone Services, Inc	—	—	—	—	150
Metromedia Long Distance	—	—	—	—	127
LDDS Communications, Inc	—	—	—	—	110
RCI Corporation/RCI Network Services	—	—	—	—	104
Others*	639	992	1,108	1,347	2,327
Long Distance Carriers	42,630	44,595	44,521	46,913	50,867
AT&T Communications Share (percent)	86.3	81.9	79.1	75.5	67.4
MCI Communications Share (percent)	5.5	7.6	8.8	10.4	12.1
US Sprint Share (percent)	3.5	4.8	5.8	7.3	8.5
Local Exchange Carriers	12,185	12,903	13,736	15,113	15,188
Total All Carriers	54,815	57,498	58,257	62,026	66,055

*Estimate

SOURCES: Local exchange carrier information derived from U.S. Telephone Association; annual reports; AT&T and Alascom information from *Statistics of Common Carriers*, Federal Communications Commission (FCC); FCC Report and Order CC Docket 83-1291.

The key factor driving the long distance industry, especially for the residential market, is price competition. Long distance companies will continue to face reduced profit margins and high short-term costs from building and maintaining the modern digital network infrastructure needed to provide quality service and reliability. The result in 1990 was an acceleration of the mergers and acquisition trend of the past few years, which is likely to continue in 1991. Another strong area of competition will continue to be the intracorporate communications and private networks market, as the top three carriers compete fiercely for lucrative corporate contracts, many worth tens of millions of dollars.

Industry Consolidation

Industry consolidation continued in 1990, as evidenced by MCI's acquisition of Telecom*USA for $1.25 billion. In addition, MCI took a write-down in 1990 of $1 billion to complete the digitization of its network. While US Sprint's network is 100 percent digitized, and AT&T's is 90 percent (after a 1989 write-down of $1 billion), MCI was only at about 40 percent in 1990, and will use its acquisition of Telecom*USA to expand its use of optical fiber networks and to push forward on network modernization. MCI will seek to capture a larger share of the data communications market during 1991. In addition, United Telecommunications announced its intention in 1990 to buy the remaining 19.9 percent of US Sprint it did not already own. Other mergers during 1990 included Telesphere Communications' acquisition of National Telephone Services Inc. for $48 million.

Other than AT&T, MCI, and US Sprint, some of the other major long distance carriers include Advanced Telecommunications, ALC Communications, Allnet Communications, Cable & Wireless North America, Litel Telecommunications, Metromedia ITT, National Telecommunications Network, RCI, Telesphere International, and Williams Telecommunications.

Remote Data Processing

As remote data processing services become ubiquitous, driven by point of sale terminals, automatic teller machines, credit card validation terminals, and other advanced services, data transmission services will grow from about $800 million in 1988 to $6 billion by 1995. Such services are provided by both common carriers and value-added service providers. Data processing firms depend on data transmission services to communicate with their customers. Data transmission services may be switched or use private lines.

Leased Circuits

About 25 percent of network usage goes to switched measured telephone service, 35 percent for WATS lines, 15 percent for virtual private networks, 15 percent to private line services, and the remaining 10 percent is attributed to other services such as discount and special access. WATS usage will decrease over the next few years as acceptance of virtual private network services increases proportionally. Virtual network services are being offered both domestically and, increasingly, on an international basis.

The demand for private leased circuits will increase more slowly, while the market for basic telephone service is likely to fall as more sophisticated, customized, and user-specific applications become more popular among corporate clientele. The market for T-1 services, private bulk rate circuits offered at 1.544 megahurtz per second, will continue to grow rapidly, and will be about $2 billion in 1991. The fastest growth is in the area of so-called fractional T-1 services, in which the bandwidth for T-1 circuits is allocated among different customers based on demand. Fractional T-1 services were reportedly growing at least 50 percent in 1990.

The market for 900-number pay per call services (sports, weather, stock quotations), currently offered by AT&T, MCI, US Sprint, and Telesphere, will grow from $500 million in 1988 to $4-5 billion by 1995. Growth in 900 services will come mainly at the expense of growth in toll-free 800 services, which should remain relatively flat through the next several years. The overall market for 800 number services, however, is about $25 billion and thus much larger. There are about 200,000 telemarketing services nationwide that depend on such services.

INTERNATIONAL TELEPHONE SERVICES

There are about 350 U.S. providers of international telephone services, carried both by satellites and by undersea cables of either copper or optical fiber.

Satellite services are provided through the Communications Satellite Corporation (COMSAT), a private company that is U.S. signatory to the International Telecommunications Satellite Organization (INTELSAT) and to the International Maritime Satellite Organization (INMARSAT). These are the global satellite cooperatives owned by the world's telephone companies. In the past few years, the FCC has authorized private undersea cables and satellite systems to compete with COMSAT and with traditional telephone carriers like AT&T.

Many developments during 1990 affected the structure of the international telephone services market. AT&T, losing market share domestically but expanding in international markets, signed an agreement with the Soviet Ministry of Communications to explore cooperation in telephone services. It also installed a new $12 million satellite earth station in California that will transpond with other earth stations in 12 Pacific Rim countries. And the company has introduced enhanced facsimile services to the United Kingdom and Japan, aided by a new U.S. trade agreement with Japan on international value-added services. AT&T's ownership of Istel, a British value-added service company, and its equipment alliance with Italtel, the Italian telecommunications company, will also provide inroads to the European services market. In partnership with Japan's KDD, AT&T also announced a deal to link the People's Republic of China to the United States and Japan with satellite and fiber optic cable facilities.

Other U.S. companies were also active overseas in 1990. Bell Atlantic and US West signed a letter of intent with Czechoslovakia to form a joint venture company to build a public packet-switched data network. These two companies also agreed to construct a national cellular telephone system and to work towards modernizing Czechoslovakia's overall network. Also, Ameritech and Bell Atlantic agreed to purchase New Zealand's state telephone company for $2.4 billion. Sweden and Hungary announced plans to privatize their telephone companies, an activity in which U.S. companies may have an opportunity to participate. Bell Atlantic won and then lost a contract to manage part of Argentina's telephone system, while Nynex now owns 50 percent of the telephone company in Gibraltar. Privatization is likely to increase in 1991.

For the first time, advanced services beyond basic telephone, telex, telegraph, and leased circuits, are now available internationally. For example, both AT&T and Japan's KDD began ISDN service to France in 1990 in cooperation with France Telecom. And MCI began providing its virtual private network service and its electronic mail services to Belgium.

Most international services, however, consist of basic switched services, including telephone, telex, and telegraph. In 1990, revenues collected by U.S. carriers from their customers for these international services originating in the United States, including services to Canada and Mexico, totaled about $8 billion. Switched telephone service accounts for at least 80 percent of that total.

In general, prices for international telephone and telex services are appreciably higher overseas than in the United States, so calls from a foreign country to the United States cost more than calls from the United States to that foreign country. This is one reason the United States generates more international calls than it receives. But since foreign companies charge more than U.S. companies for connecting international calls, the United States pays out more than it receives; the U.S. net settlements deficit for international telecommunications traffic rose from approximately $40 million in 1970 to more than $2 billion in 1990, as shown in Table 2. The FCC estimates that $1 billion of this deficit is a direct subsidy paid by U.S. consumers to foreign telecommunications administrations that charge overly high prices to other telephone companies for completing international calls.

Table 2: U.S. Trade in Int'l. Telephone Services

(in millions of dollars)

	1985	1986	1987	1988
Payments	2,594	3,014	3,496	4,017
Receipts	1,467	1,598	1,836	1,985
Balance	−1,127	−1,416	−1,660	−2,032

Note: Data do not include value-added network services, database, or data processing revenues; data for Canada include only AT&T.
SOURCE: Federal Communications Commission.

The deficit is produced almost entirely by telephone traffic, which is growing 20 percent a year, while telegraph and telex have been declining (see Table 3). The deficit is keeping pace with growth. With 20 percent compounded annually, the deficit will double about every 3.6 years. If the current growth rate and settlements practices are maintained, the deficit will be about $7 billion in seven years.

Table 3: Volume of International Telephone Traffic

(in millions of messages)

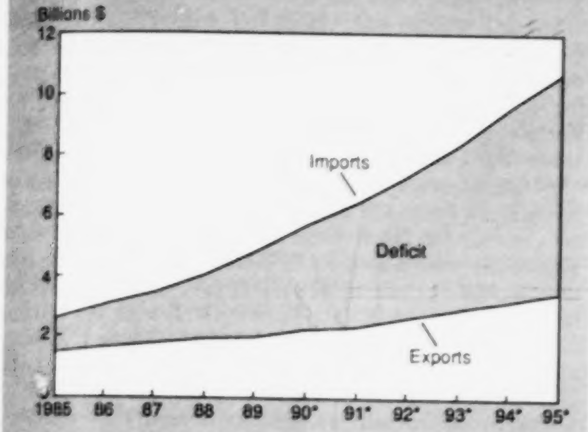
	Telephone	Telex	Telegraph
1975	43	42	14
1976	52	50	13
1977	67	61	13
1978	91	73	12
1979	120	87	12
1980	145	100	12
1981	186	114	11
1982	236	122	9
1983	289	131	8
1984	343	140	6
1985	414	145	5
1986	500	138	4
1987	625	124	3
1988	814	93	3

Note: Includes messages that originate and terminate in the United States; excludes service to and from Canada and Mexico.
SOURCE: Federal Communications Commission.

In 1990, the FCC opened an inquiry into the way international payments are established and suggested that it might encourage rate negotiations between U.S. and foreign carriers in order to lower accounting rates for services, thereby reducing the deficit.

A major reason for the growth in international telephone service appears to be falling costs; the average cost per message dropped 55 percent between 1975 and 1988. On the other hand, the cost of telegraph service rose by 150

Figure 29-1
U.S. Telecommunications Services Trade Deficit



* Estimated.
Source: Federal Communications Commission and U.S. Department of Commerce, International Trade Administration.

percent, suggesting that users have found more economical alternatives. Telex prices decreased 13 percent over the same period, and demand increased until 1986, when electronic mail and other substitutes began eroding the market position of the older technology.

The average cost of international telephone service dropped from $21.42 per message in 1975 to less than $9 in 1990, and this trend is likely to continue. In contrast, telegraph rates have risen from an average $6.77 per message in 1975 to more than $17 in 1990. Telex prices have remained relatively stable, going from $7.64 in 1975 to about $6 in 1990.

The primary reason for the fall in prices is the declining cost per voice channel in transoceanic and satellite systems. As a comparison of trans-Atlantic cable systems shows (see Table 4), the 1970 cost per voice path was approximately $49,000, while in 1988 the cost was about $9,000. The underlying reason for the dramatic decrease in costs is the technology that has enabled the total capacity of cables to increase substantially from 1,440 voice paths over a coaxial cable in 1970 to 37,800 voice paths over fiber optic cable in 1988.

Table 4: Trans-Atlantic Cable Systems, 1956–1992

System	Year	Technology	Total Invest. Cost ($ mill)	Cable Capacity Voice Paths	Cost per Voice Path
TAT-1*	1956	Coax Cable	$ 49.6	89	$557,079
TAT-2	1959	Coax Cable	42.7	98	435,714
TAT-3	1963	Coax Cable	50.6	175	289,143
TAT-4	1965	Coax Cable	50.4	138	365,217
TAT-5	1970	Coax Cable	70.4	1,440	48,889
TAT-6	1976	Coax Cable	197.0	8,000	24,625
TAT-7	1983	Coax Cable	194.6	8,400	23,167
TAT-8	1988	Fiber Optic	335.4	37,800	8,873
TAT-9	1992	Fiber optic			
US-UK			14.1	3,150	4,476
US-France			17.3	3,150	5,492
US-Spain			19.2	3,150	6,095

*Trans-Atlantic Telephone Cable.
SOURCE: Federal Communications Commission.

AT&T, the largest U.S. carrier of international calls, had 1988 revenues of $2.7 billion. The most significant international calling destinations for AT&T customers in the United States were the United Kingdom, West Germany, Japan, the Philippines, Australia, India, and Korea, each representing at least $40 million.

MCI and US Sprint entered the international market in the mid-1980s. With respect to telephone service, MCI's international revenue was $205 million in 1988, and Sprint's was $73 million. MCI subsidiaries, Western Union International and the newly-acquired RCA Globcom, also generated $226 million in revenues for international record services (i.e., telex and telegraph) in 1988. MCI and Sprint derive substantial portions of their revenues from Canada, Mexico, the United Kingdom, Japan, France, and Italy. AT&T's international message telecommunications service (IMTS) market share eroded somewhat during the 1985–1988 period, but remained very large through the late 1980s (see Table 5). AT&T's market share for international traffic is likely to erode further during 1991.

Table 5: AT&T's Market Share, IMTS Revenues* for Service Originating in the United States, 1985–1988

(percentage)

	1985	1986	1987	1988
Australia	94.4%	87.0%	83.2%	80.2%
Colombia	100.0	100.0	100.0	94.3
Dominican Republic	100.0	97.3	96.5	98.6
France	100.0	93.9	82.1	79.9
Italy	100.0	98.3	91.0	86.8
Japan	100.0	97.7	88.8	83.6
Korea	100.0	100.0	100.0	99.4
Taiwan	97.3	83.4	80.4	77.9
United Kingdom	95.1	87.5	84.5	81.3
West Germany	100.0	100.0	100.0	92.2
All IMTS	98.4	95.0	93.1	89.7

*International Measured Telephone Service. Data excludes service to Canada and Mexico.
SOURCE: Federal Communications Commission.

Value-Added Network Services

The major trend shaping market structure during 1991 in the value-added network services (VANS) business will be global connectivity. VANS include packet-switched and public data services; telecommunications and information gateway services; code and protocol processing and conversion; electronic mail services; electronic data interchange; travel reservation systems; voice mail services, including voice store and forward; audiotex (interactive 900 telephone) services; enhanced facsimile services, such as store and forward; alarm and security services; utility and environmental monitoring; transaction and credit validation services; electronic funds transfer; automated teller machine services; point-of-sale transaction services; electronic banking; data processing services; on-line database access; information retrieval services; videotex (on-line data base) services; telecommunications network management services; remote computer monitoring services; electronic software distribution; and computer processing and data preparation.

VANS are one of the fastest growing segments of the telecommunications services industry, expanding at a rate of at least 10 percent annually. U.S. revenues in 1990 were approximately $670 million for public data networks providing enhanced services. Data processing services totalled about $30 billion, and on-line database services were about $4 billion. Revenues for Electronic Data Interchange (EDI) services, one of the fastest growth areas for VANS, were about $800 million in 1990. EDI will continue to experience high growth rates in 1991. In 1987, according to the EDI Association, there were only 1,465 users, 8,800 in 1990, and more than 9,000 expected in 1991.

Other VANS with high growth during 1991 will be transaction oriented, with such services as claims processing, point-of-sale settlement, and credit card validation. Demand is also growing for public data communications networks to interconnect local area networks (LANs) using high-speed access to packet-switched networks and other new technologies. With over 18 million LAN nodes worldwide and more than a 20 percent annual growth rate in the LAN industry, this will develop into a major business for value-added service providers.

A variety of companies are considered "value-added" carriers or network service providers. Generally, value-added networks purchase leased circuits from common carriers and optimize their use by providing packet-switching, protocol and speed conversion, and security, administrative and billing features. The client in turn receives a less expensive, more reliable, and more robust data communications service than usually would be available from a basic telephone carrier.

International VANS Alliances

The trend toward global networking to meet multinational corporate demand is driving foreign investment in the United States and forcing U.S. companies to forge overseas strategic alliances and joint ventures in the value-added and data communications market. During 1990, this trend was evident as General Electric Information Services (GEIS) announced plans to add Asia as a site for a fourth network to complement facilities in New Jersey, Paris and London. GEIS also began voice mail service to England, and introduced an international video-conferencing service between London, the United States, and Japan. British Telecom acquired Tymnet from McDonell-Douglas for $355 million, while France Cables and Radio, a subsidiary of France Telecom, acquired 80 percent of Cylix Communications, a U.S. provider of value-added data communications services and of very small aperture terminal satellite networks. France Cables, through a U.S. holding company, also holds 14.9 percent of TRT/FTC Communications, an international carrier mostly owned by the U.S. company Pacific Telecom Cable.

MCI Communications purchased a 25 percent share in Infonet, a data networking company owned by telecommunications administrations in France, Germany, Belgium, Sweden and Spain. AT&T now owns Istel, a British value-added services provider, which will augment its ability to provide electronic mail and related services on a global basis. And Japan's NTT Data Communications opened a large facility in New Jersey. Also in the international arena, Canada and the United Kingdom opened to competition their markets for long-distance voice telephone services; the United States negotiated a new agreement further opening the value-added services market with Japan; and discussions continued in Geneva at the General Agreement on Tariffs and Trade (GATT) organization on whether to subject world trade in telecommunications services to the disciplines of international trade law, which could guarantee access to and use of basic telecommunications services worldwide.

Domestic VANS Alliances

Western Union and US Sprint joined together their E-Mail networks, while US Sprint folded its Telenet data communications subsidiary into its long-haul carrier organization, now called the Sprint Data Group. Sprint and BT Tymnet together control about 75 percent of the U.S. value-added public data services market.

In videotex services, there are more than two dozen commercial systems in operation in the United States. Data on some of the larger firms are presented in Table 6. In 1990, there were nearly 1.7 million subscribers of videotex services, an increase of 20 percent over 1988. The market size is estimated at $99.9 million in 1987, $159.9 million in 1988, and about $200 million by 1991. Online databases and interactive services continue to experience significant growth, and provide a stimulus to the public data networks, which are used as a means of access. There are more than 4500 databases available in the United States via at least 620 online services.

Table 6: Videotex Subscribers

Name	1/1/87	1/1/88	1/1/89
CompuServe	340,000	400,000	525,000
GEnie	37,000	85,000	150,000
Quantum Link			85,000
Prodigy			65,000
Portal			50,000
Delphi			50,000
Boston CitiNet			45,000

SOURCE *Interactivity Report*, Digital Information Group.

Rates and Tariffs

Despite the AT&T divestiture as of January 1984, and the competition stemming from more liberal FCC policies, subsidies in the form of access charges paid by long distance to local telephone carriers in the United States continue to be substantial, helping keep down the cost of local service. While U.S. inflation has averaged 6.1 percent annually since 1977, the increase in the cost of telephone service has averaged only 4.4 percent, according to the U.S. Bureau of Labor Statistics. Between 1977 and 1989, the inflation adjusted price of telephone service decreased by 24.3 percent. American consumers pay only about 2 percent of their income for telephone service, roughly the same percentage as in 1974.

Price changes have been most dramatic for long-distance telephone service, where (in current dollars) prices have risen 0.6 percent a year on average, less than one-tenth the overall rate of inflation. Real prices have fallen by 45.7 percent, while for interstate services alone the drop has been 59.7 percent since 1977. The real price of an intrastate telephone call was 26 percent less in 1989 than it was in 1983, while the price of an interstate long distance call is 46.3 percent less today.

For local telephone service, rates rose during the 1980s. Consumers pay about 5.9 percent more in real terms for local service today than 10 years ago. However, the real price of local service has begun to decline recently, and since 1986 has fallen 3.0 percent.

The price for international calls has also decreased substantially and is well below that in other industrialized countries. Between 1977 and 1987, the average price per minute for an international call originating in the United States fell from $2.20 to $1.16. Adjusted for inflation, these data represent a 71.8 percent price decrease. In 1988, the price per minute for long distance calls originating in the United States and terminating in the 10 countries with the highest volume of U.S. traffic was 28 percent lower than for calls going in the opposite direction. Prices for international services will continue to fall during 1991.

During the first half of 1990, the Consumer Price Index for telephone service increased slightly, as increases in the cost of local service offset declines in the cost of long distance services. Local service prices rose at an annual rate of 4.4 percent, while the cost of interstate calling declined at a rate of 2.9 percent and the cost of state toll calls fell at a rate of 2.7 percent. As a result, the composite Consumer Price Index for telephone service increased at an annual rate of 1.9 percent. The nation's overall rate of inflation during the first half of 1990 was 6.1 percent. Thus, after adjusting for inflation, the real cost of telephone service fell at a rate of about 4 percent.

Telecommunications Policy Developments

In a major development, the Ninth Circuit Court of Appeals in California overturned the FCC's Third Computer Inquiry decision, throwing into question the issue of Open Network Architecture (ONA) and competition safeguards. In response, the FCC indicated it would continue its ONA program and open a new inquiry docket on the issue of competition policy and so-called non-structural safeguards that do not require AT&T and the RHCs to maintain separate subsidiaries for the provision of unregulated services. See the *1987 U.S. Industrial Outlook*, chapter 31 (Telecommunications Services), for a fuller discussion of these issues.

The FCC also sought comments on a plan to lessen regulation of AT&T long distance services provided to large business customers, but maintain current policies for services provided to small business and residential customers. The FCC proposed that AT&T be permitted to provide customized, single-customer services to large business users under contract instead of tariff, or through private offerings not regulated by the FCC. In developments related to the AT&T divestiture, hearings were held in Congress during 1990 to investigate amending the Modified Final Judgment of the AT&T divestiture Consent Decree and lifting the line-of-business restrictions on the RHCs; this effort will continue in 1991. AT&T has been subject to greater regulation than other long-distance carriers since its divestiture because the FCC designated the company a "dominant" firm in the industry. As AT&T has lost considerable market share since divestiture, however, and the Regional Holding Companies now offer all long-distance carriers equal access to the local exchange network, the FCC proposes to reduce the level of regulation imposed on the company.

In a significant regulatory development, the FCC decided in October 1990 to impose a system of rate regulation known as price caps on GTE and the Bell Operating Companies' interstate access services, despite strong opposition from users and many long distance companies. In so doing, the FCC reduced the companies' allowable rate of return from 12 percent to 11.25 percent, but ruled that they can now retain additional profits from exchange access services. The plan will be voluntary for all other local exchange carriers, and is designed to provide the telephone companies with greater incentives to become more productive. The FCC estimates the plan will result in lower interstate access charges of $337 million in 1991, savings which long distance carriers can then pass on to their customers. Lower rates are likely to stimulate network usage, helping drive up carriers' revenues.—*Ivan H. Shefrin, Office of Telecommunications, (202) 377-4466, September 1990.*

CELLULAR AND RADIO SERVICES

Radio communications are becoming an increasingly dynamic force in the telecommunications services industry, spurred primarily by new technologies and strong demand.

The three most important new technologies are digital cellular, PCNs (personal communications networks), and CT-2 (advanced cordless systems). Cellular phones and PCNs handle 2-way communication; CT-2 handles only 1-way (outgoing) calls. Cellular is the only one that has permanent authorization from the FCC; a few CT-2 and PCN companies have been granted trials. Both PCNs and CT-2 have already been authorized in the United Kingdom.

Cellular technology involves cell sites located around a metropolitan area, and software that hands off calls from one site to another, enabling customers to travel without interrupting calls. Sixty percent of the cellular traffic is vehicular. Cellular also has the capacity of handling calls from handheld portable units, but PCN and CT-2 companies are hoping to make inroads in the pedestrian market with their less expensive customer units and service charges.

Cellular

Annual revenues from cellular telephone services were about $5.2 billion in 1990, with over $8 billion collected since service was first inaugurated in 1983. Revenue growth was about 50 percent in 1990. There were 4.4 million subscribers by mid-1990 and over 7 million subscribers expected by 1991, up from 3.5 million in 1989. Worldwide, there were more than 10 million users of mobile cellular telephone service in 1990. Service was available in all U.S. metropolitan areas and was being installed in many rural areas. There are about 375 companies that resell cellular telephone service; gross capital investment in the industry reached a cumulative level of more than $5.2 billion in mid-1990, up 16 percent in 6 months. The market research firm Dataquest estimates that cumulative revenues should be $7.6 billion by 1993, with the projected compound annual growth rate expected to increase to 22.6 percent.

The cellular industry's consolidation process, marked by two notable mergers in 1990, is expected to continue at a slower pace in 1991. The trend of large corporations expanding their cellular operations by combining with smaller firms is likely to predominate. In July 1990, GTE and Contel announced their intention to merge. If approved by the companies' boards and the FCC, this $6.2 billion deal would create the country's second largest cellular operator, with about 500,000 subscribers. Both companies had been aggressively acquiring cellular operations.

Similarly, Pacific Telesis and Cellular Communications Inc. (CCI) announced plans in August 1990 to combine cellular operations in the Midwest as part of an agreement that will allow Pacific Telesis to eventually buy out CCI. The initial $87 million agreement will create one of the three largest regional cellular networks with over 530,000 subscribers. If approved by the FCC and shareholders, the deal is expected to close in the second or third quarter of 1991. McCaw Communications provides cellular telephone service to more than 850,000 customers.

PCNs and CT-2

Spectrum shortage problems which have plagued the cellular industry will continue to worsen in 1990 due to experiments with new technologies for which no permanent spectrum has been allocated. Overcrowding of the finite radio spectrum, coupled with a surge of innovative proposals for new spectrum-dependent services such as CT-2 and PCNs, led to consideration of several possible resolutions. If the Emerging Telecommunications Technologies Act is passed in the final quarter of 1990, it would reassign 200 MHz of government spectrum to the private sector. Spectrum auctions and user fees also have been suggested. The FCC is likely to look most favorably on proposals demonstrating high spectrum-efficiency.

PCNs utilize personal handsets or cordless telephones that would operate in a variety of pedestrian, office, residential, and possibly vehicular settings, via microcell technology. This concept moved closer to reality in 1990 when the FCC approved experimental licenses for several PCN trials. Strong industry interest has also compelled the FCC to begin an inquiry into authorizing PCNs on a commercial basis. Entities interested in building PCNs expect that PCN products and services will be far less expensive than their cellular counterparts.

Several trials of these new technologies will begin in 1991, with CT-2 operating in New York and Florida at 940 to 941 MHz; and PCN trials running in Washington, D.C. (American Personal Communications), and in Houston and Orlando (Millicom subsidiary PCN America) at the 1.7 to 2.3 GHz frequency.—*Linda Gossack, Office of Telecommunications, (202) 377-4466, September 1990.*

SATELLITE SERVICES

In the satellite services industry, innovative proposals for new applications will generate growth in 1991. Annual revenues from the three broad areas of satellite services, Fixed Satellite Services (FSS), Mobile Satellite Services (MSS), and Direct Broadcast Satellite (DBS) services, are expected to rise from $800 million in 1990 to around $1 billion by 1992.

In 1990, 29 operational U.S. communications satellites were in orbit, run by six U.S. domestic satellite operators. These satellites carried approximately 588 transponders in 1990, thought to represent around 38 percent of civilian transponders available worldwide. Industry sources indicate that increases in demand are closing in on currently available transponder space, with the highest growth in demand coming from video services. Although most of these satellites will reach the end of their lifespan in the early 1990s, a number of planned satellite launches will augment transponder availability. In the latest (November 1988) FCC processing round for satellite system applicants, which will provide satellite capacity through the 1990s, seven companies applied for permission to construct and launch a total of 15 satellites plus 3 ground spares. The new transponder capacity of these 15 satellites will be roughly equivalent to 330 Ku-band transponders and 144 C-band transponders, easing the tight supply.

Fixed Satellite Services

The Fixed Satellite Services area continues to be dominated by basic video broadcast services such as Cable TV (CATV) and other television markets. These services currently represent around 60 percent of all satellite revenues. Telephone services' contribution to satellite service revenue has been shrinking as fiber optic cable telephone systems gain an increasing share of the market.

U.S. revenues from international satellite services, both from the International Satellite Organization (INTELSAT) and from separate systems, continued to rise in 1990. COMSAT, the U.S. representative to INTELSAT, reported that its 1989 international revenues of $412 million represented an annual increase of more than 15 percent over 1988 satellite service revenues. COMSAT revenues from INTELSAT increased to $280 million in 1989, due primarily to an increase in voice circuit traffic and international business (private line) services. Video, voice, and data traffic to and from the United States rose 11 percent in 1989, with the strongest growth in voice-grade telephone traffic. However, the growth in voice transmission will likely be offset by COMSAT's wider use of digital compression technology. COMSAT predicts an increase in the relative share of video and data, where digital compression technology is less prevalent.

International satellite systems separate from INTELSAT, owned either privately or by international consortia, continued to redefine their role in 1990. The only operational U.S. separate system was PanAmSat's PAS1, with Orion and Columbia—also U.S. owned—nearing launch dates. Four additional applicants have not yet secured the requisite foreign operating agreements for further FCC licensing. In July 1990, PanAmSat petitioned the FCC to allow separate system operators to link with public switched telephone networks, arguing that increased competition with INTELSAT would lower the cost of such telephone services. PanAmSat, which provides video and data transmission for the U.S., South and Central America, and Europe, plans to launch an additional satellite system for the Pacific Rim by late 1993. Orion, the second U.S. operational separate system to win approval from INTELSAT, plans to launch its two-satellite private system into Atlantic orbital slots by late 1992 and has reportedly concluded satellite service agreements with several unnamed European countries. However, the FCC has yet to approve Orion's construction and operating license, due to concerns regarding its ability to meet the equity financing criteria. Columbia recently won a court contest with COMSAT to use Tracking and Data Relay Satellite (TDRS) capacity on two NASA satellites, advancing its planned separate system.

Interest in separate systems remains high overseas; however, INTELSAT's prohibition against separate systems interconnecting with public switched networks for international telephone services has remained an obstacle for new separate systems. While AsiaSat, a privately-owned satellite launched in April 1990, currently provides only domestic services (video, voice, and data) for Asian nations, it may benefit from PanAmSat's petition to overrule the separate systems prohibition.

The U.S. market for private FSS networks using satellites for internal corporate communications will continue its upward trend in the 1990s. The private FSS networks of choice are currently Very Small Aperture Terminal (VSAT) systems that operate within Ku-band frequencies and use antenna dishes as small as 1.2 meters in diameter. Around 160 VSAT systems were operational in 1990, with some 180,000 private satellite network earth stations projected to be in place by 1992. Industry analysts predict that revenues will grow at around 20 percent a year, reaching as much as $1.7 billion by 1992. VSAT's low cost, said to be 50 percent lower than leased line costs, will continue to attract businesses interested in more efficient and economical data communications, training, video conferencing, and voice telephone technology. Major VSAT networks can be expected to be brought on line at the rate of 10 to 15 annually for the next five years, and to use approximately 20 to 25 percent of available transponder space by the end of that period. However, because the VSAT market for major corporate end-users is almost saturated, longer term U.S. market opportunities lie with medium and small-sized companies. While data on foreign private FSS networks are not available, such networks are attractive as alternatives to leased-line systems.

Mobile Satellite Services

The mobile satellite service market had a boost in 1990 by several proposals for light satellite systems, launched in low-earth orbit (LEO) and operating under 1 GHz. This trend appears to be based on the availability of cheaper launches, as initiated by Orbital Sciences Corporation's Pegasus launch service. As a result of these proposals, annual revenues from LEO mobile satellite services may rise to $3 to $5 billion by the year 2000. The nascent industry is looking to the 1992 World Administrative Radio Conference (WARC) to allocate needed bandwidth and to establish international norms for licensing mobile systems.

The FCC has received two LEO mobile satellite services applications: Star Net, proposed by Starsys to provide two-way communications and position determination services using spread spectrum technology; and Orbital Communications' Orbcomm proposal for as many as 20 LEOs, heavily concentrated in emergency and personal communications services. While Motorola has not yet filed with the FCC, that company announced an innovative satellite-cellular telephone system, Iridium, in June 1990. That system would include 77 LEO satellites for a digital switched network in space, providing worldwide cellular-type coverage. The system is planned for full service by 1996.

With the evolution of new MSS applications, annual revenues are projected to reach $150 to $200 million worldwide by 1992, and $1 billion by 1995. Plans by COMSAT and the American Mobile Satellite Corporation (AMSC) for airborne MSS were boosted by the FCC's allocation of L-band spectrum for MSS, and by a proposal for technical standards and licensing procedures for aircraft earth stations. The FCC also provisionally allowed L-band maritime mobile satellite services to be transmitted via INMARSAT for specified aeronautical and land mobile satellite services. Also, the International Airline Telecommunications Society (SITA), one of the world's largest global networks, will begin offering digital air-to-ground data transmission services via satellite in 1991.

Direct Broadcast Satellite Services

While no Direct Broadcast Satellite (DBS) services were active in the United States, interest in the technology continued to run high. DBS, which would offer more video channels at potentially lower cost than cable television, as well as voice and video quality higher than traditional cable broadcasts, is widespread in Japan and parts of Europe. Both the U.S. Senate and House had bills pending in 1990 that would "re-regulate" the cable television (CATV) industry and encourage competition by ensuring access to programming by alternative multichannel applications, including DBS services. However, high start-up costs and difficulties of penetrating the CATV markets, rather than regulating barriers, are the prime obstacles to a true DBS system. Digital video compression technology associated with the emerging High Definition Television (HDTV) industry is seen as a potential catalyst to wider acceptance of DBS applications. The increased bandwidth requirements and frequency allocation problems now plaguing HDTV could be moderated by using a DBS system.

Nine U.S. companies have been granted conditional permits by the FCC for high-power, "true" DBS services, operating on the Ku-band with downlinks between 12.2 and 12.7 GHZ on frequencies dedicated solely to DBS. While no U.S. DBS launches have been made to date, the FCC reports that all nine permitees have submitted evidence of "due diligence" in contracting the construction of DBS satellites. The first satellite launch for high-power DBS is slated for late 1993 by Sky Cable, a $1 billion, 108-channel service planned by a joint venture of Hughes Communications Inc., Cablevision Corporation, NBC, and Rupert Murdoch's News Corporation Ltd.

Medium-power DBS, which operates in the 11.7 to 12.2 GHz range on FSS-designated bands, promises more immediate service, as the application uses existing technology and can utilize satellites already in orbit for other applications. SkyPix, a Seattle-based firm, plans to launch an 80-channel, medium-power DBS service with nationwide availability as early as May 1991. The project would be the first DBS system to use video compression techniques for digital broadcast of programming such as pay-per-view (PPV) television and movies. Also scheduled for launch by late 1990 or early 1991 was a 10-channel, PPV DBS system planned by K-prime Partners, a venture of nine cable multiple system operators (MSOs), including TeleCommunications Inc. and Viacom.—*Patricia Cooper, Office of Telecommunications, (202) 377-4466, September 1990.*

Outlook for 1991

Revenues of the domestic telecommunications service companies are expected to increase 5.7 percent in 1991, with low growth caused by the possibility of economic slowdown, reduced housing and commercial construction, and lower corporate telecommunications expenditures. Long distance revenue will grow about 6 percent while international service revenues should drop slightly from 1990 levels. However, value-added telecommunications and data communications services will continue to experience growth rates of 15 percent during 1991 as the U.S. network becomes increasingly digitized, and commercial ISDN products develop more rapidly. Cellular telephone revenues will increase about 37 percent. Call volume will continue to expand in 1991, but this may be offset by moderate price reductions in local and long distance services. The number of mergers and acquisitions is likely to slow from the pace of recent years.

Long-Term Prospects

The next decade is likely to be one of significant change for the telecommunications services industry, which may look quite different in terms of market structure within the next five years. The merging of public and private telecommunications networks, the explosion of new mobile communications technologies and services, the introduction of broadband transmission, ubiquitous digitization, and virtually cost-free bandwidth are some of the forces that will shape the change. For regulators, the convergence of technology and market forces means even greater difficulties in keeping unregulated activities distinct from tariffed services.

Public data networks in the United States will face increased competition during the 1990s from new technologies such as virtual private network services, software-defined data services, an advanced method of circuit and packet-switching known as frame relay that will allow simultaneous voice and data communications, fast-packet switching at high bandwidth that will also allow voice communications as well as data, optical fiber systems using SONET (fiber optic) technology, and broadband ISDN. SONET technology will experience an especially high growth rate, both in the United States and abroad. France Telecom plans to add the capability by 1992, for example. The overall trend for both value-added services and common carriers will be to integrate voice and data applications at very high speeds.

Voice messaging and speech recognition will also play a major role in the industry during the coming years, as will store-and-forward enhanced facsimile services, EDI and electronic mail. Carriers will attempt to integrate such services into single-service packages. In terms of user applications, the penetration of such sophisticated telecommunications services into the residential market has been much slower than for business customers. However, it is likely that with the growing concerns over scarce energy resources and environmental quality, services oriented towards telecommuting will become more widespread during the 1990s, as workers increasingly spend more time away from the office. The growth of at-home work may spur the development of more advanced telecommunications business services into the residential market. Such trends were already evident during 1990, as AT&T and the state of Arizona planned a test to discover whether telecommuting can improve environmental quality, and may ultimately lead to a market convergence between business and home customers.—*Ivan H. Shefrin, Office of Telecommunications; (202) 377-4466, September 1990.*

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Telephone and Telegraph Equipment

U.S. product shipments of telephone and telegraph equipment (SIC 3661), measured in 1987 dollars, increased about 2 percent in 1990 and should increase approximately 1.5 percent in 1991. Shipments of both network equipment and customer premises equipment are expected to increase as the demand for telecommunications equipment continues to show slow but steady growth.

The telephone and telegraph equipment industry (SIC 3661) includes manufacturers of switching and switchboard equipment, telephone instruments, teleprinting and telex equipment, and other telephone and telegraph apparatus and parts. These products can be grouped into two categories, network equipment and customer premises equipment. Network equipment comprises the transmission medium of the telecommunication system, while customer premises equipment, sometimes called terminal equipment, is attached to the network to send and receive messages. Microwave systems, mobile radio systems, satellite communications equipment, fiber optics, and cellular radio equipment (except network switches) are discussed in Chapter 31, Radio Communication and Detection Equipment.

Before reading this chapter, please see "How to Get the Most Out of This Book" on page 1. It will clarify questions you may have concerning data collection procedures, factors affecting trade data, forecasting methodology, the use of constant dollars, the difference between industry and product data, sources and references, and the Standard Industrial Classification system (SIC). For other topics related to the subject of this chapter, see chapters 27 (Information Services), and 29 (Telecommunications Services).

U.S. product shipments of telephone and telegraph equipment, measured in 1987 dollars, increased about 2 percent in 1990 to $17.8 billion. Shipments of both customer premises equipment and network equipment increased during this period.

Network Equipment

Network Equipment consists of transmission systems and switches that are purchased by public or private network operators. Transmission systems include multiplexing equipment, repeaters, line conditioning equipment, and wire. Switches complete connections between callers and route information from one network user to another. Switches include central office switches, packet switches, mobile telephone switching offices (MTSOs), microwave switches, and data communications switches.

Product shipments of network equipment were expected to increase 2 percent in constant dollars, to $13.7 billion in 1990. Shipments of central office (CO) switches were estimated at $4.8 billion, up about 2 percent from $4.7 billion in 1989. Strong competition in this product area has resulted in price-cutting by vendors that has depressed revenue growth. Carrier line equipment shipments increased 2 percent, from $4.8 billion in 1989 to $4.9 billion in 1990.

New construction and equipment upgrading by telecommunications carriers contributed to the growth in shipments of network equipment in 1990. U.S. telecommunications carriers expenditures for equipment and building construction increased slightly to just over $24 billion in 1990 as a small increase in spending by the Bell operating companies (BOCs) and other local exchange carriers

Trends and Forecasts: Telephone and Telegraph Apparatus (SIC 3661)

(in millions of dollars except as noted)

Item	1987	1988[1]	1989[2]	1990[2]	1991[3]	Percent Change 1987-88	1988-89	1989-90	1990-91
Industry Data									
Value of shipments[4]	17,583	17,736	18,062	18,547	19,117	0.9	1.8	2.7	3.1
Value of shipments (1987$)	17,583	18,275	18,640	18,926	19,213	3.9	2.0	1.5	1.5
Total employment (000)	112	110	111	105	104	−1.8	0.9	−5.4	−1.0
Production workers (000)	58.6	56.3	56.0	52.2	52.0	−3.9	−0.5	−6.8	−0.4
Average hourly earnings ($)	12.33	13.35	13.40	13.16	—	8.3	0.4	−1.8	—
Capital expenditures	552	621	—	—	—	12.5	—	—	—
Product Data									
Value of shipments[5]	16,529	16,564	16,902	17,424	17,955	0.2	2.0	3.1	3.0
Value of shipments (1987$)	16,529	17,068	17,443	17,780	18,045	3.3	2.2	1.9	1.5

[1] Advance data from the 1988 Annual Survey of Manufactures.

[2] Estimate.

[3] Forecast.

[4] Value of all products and services sold by establishments in the telephone and telegraph apparatus industry.

[5] Value of products classified in the telephone and telegraph apparatus industry produced by all industries.

SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA). Estimates and forecasts by ITA.

Telephone and telegraph equipment shipments are expected to increase an average of 2 to 3 percent during the next five years.

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(LECs) offset a slight decline in spending by interexchange carriers (IXCs).

Local exchange carriers purchase more than 80 percent of network equipment in the United States. Spending by LECs rose to about $20.1 billion in 1990 from $19.8 billion in 1989, according to *Telephony* magazine. Outlays by interexchange carriers declined slightly to $4 billion. The U.S. public switched telephone network (PSTN) grew 2.9 percent in 1990, when measured by number of access lines, according to preliminary figures of the United States Telecommunications Association. In addition, network operators continue to modernize existing facilities, and the percentage of access lines served by digital switches steadily increases.

The implementation of integrated services digital network (ISDN) technologies increased significantly in 1990, and ISDN growth is expected to increase through the rest of the decade. ISDN integrates voice and data, including graphics and images, allowing network operators to offer a wide variety of services using standardized interfaces to meet customers needs.

Demand for digital central office switches is expected to increase in the early 1990s, as local exchange carriers replace existing electromechanical switches. An important factor in the drive to convert to digital switches is their ability to allow local carriers to offer specialized services. Custom local area signaling services (CLASS) include caller indentification, caller ID blocking, selective call forwarding, distinctive ringing, continuous redial, and last call return. Charges range from $3 to $8 per month for each service. CLASS services have proven popular among consumers and offer carriers a significant source of additional revenues.

Customer Premises Equipment

Historically, the three largest categories of customer premises equipment (CPE) have been telephone sets, key systems, and private branch exchanges (PBXs). Key telephone systems are multi-line business communications installations used without a PBX. PBXs are switches located on the customer's premises that are capable of handling voice and data traffic and offering additional options such as voice storage and messaging. In recent years other categories of CPE, such as facsimile machines, telephone answering machines, and modems, have become widely accepted and increasingly important components in the CPE marketplace.

U.S. product shipments of CPE, measured in 1987 dollars, increased 2.5 percent in 1990 to $4 billion, reflecting strong demand and product innovation by U.S. manufacturers.

While PBXs, key systems, and telephones still constitute the bulk of CPE shipments, growth rates for these products are flat. Meanwhile, voice messaging systems, call accounting systems, and local area network (LAN) equipment are experiencing rapid growth rates and assuming greater importance in the U.S. CPE market. U.S. manufacturers continue to find excellent marketing opportunities for new CPE technologies overseas as foreign telecommunications administrations liberalize their markets for CPE. Facsimile machines, answering machines, and cordless telephones also are among fast growing CPE product sectors, but there are virtually no U.S. producers of these items.

U.S. shipments of PBXs, one of the largest CPE categories, remained at just over $1 billion in 1990, unchanged from 1989. The PBX market in the United States is mature, and shipments are generated primarily by replacement or add-on sales. U.S. shipments of key systems increased slightly in 1990 despite falling demand, as sales of many imported systems were severely depressed because of penalty duties imposed as a result of an antidumping investigation. Shipments by existing U.S. manufacturers were augmented by new plants built in the United States by foreign manufacturers anxious to avoid the dumping penalties.

Employment

Employment declines in the telephone and telegraph equipment industry result from continuing efforts by the industry to reduce costs through automation and increased productivity in the face of intense market competition. While overall employment levels are expected to continue to decline, the change should be at a moderate rate.

INTERNATIONAL COMPETITIVENESS

The U.S. trade balance in telephone and telegraph equipment registered a deficit of $1.76 billion in 1990, according to preliminary data. This represented a 23 percent improvement over the 1989 deficit of $2.29 billion.

U.S. Exports and Imports
Telephone and Telegraph Apparatus
(in millions of dollars except as noted)

SIC	Industry	1989	1990[1]	1991[2]	Percent Change 1989-90	Percent Change 1990-91
3661	Telephone and telegraph apparatus					
	Value of exports	2,006	2,103	2,200	4.8	4.6
	Value of imports	4,293	3,860	4,000	−10.1	3.6

[1] Estimate [2] Forecast

SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA). Estimates and forecasts by ITA.

U.S. telephone and telegraph product shipments benefited from an increase in export sales, which rose almost 5 percent in 1990, increasing to $2.10 billion from $2.01 billion in 1989. The continued increase in export sales reflects improved access for U.S. suppliers to foreign markets and the generally high quality of U.S. telecommunications equipment.

Most U.S. imports of telecommunications equipment are from countries in the Far East—China, Korea, Singapore, and especially Japan. The majority of our telecommunications imports are in lower technology CPE products, for example, telephone sets, cordless phones, telephone answering machines, and facsimile machines. A significant proportion of these imports are attributable to the foreign manufacturing operations of U.S.-based companies.

U.S. Trade Patterns in 1989
Telephone and Telegraph Apparatus
SIC 3661
(in millions of dollars, percent)

Exports	Value	Share	Imports	Value	Share
Canada & Mexico	356	17.7	Canada & Mexico	496	11.6
South America	83	4.1	South America	0.0	0.0
European Community	494	24.6	European Community	162	3.8
East Asia NICs	453	22.6	East Asia NICs	1,706	39.7
Japan	260	12.9	Japan	1,788	41.6
Other	362	18.0	Other	142	3.3
World Total	2,006	100.0	World Total	4,294	100.0
Top Five Countries					
	Value	Share		Value	Share
United Kingdom	314	15.6	Japan	1,788	41.6
Japan	260	12.9	Canada	435	10.1
Canada	227	11.3	South Korea	333	7.8
Taiwan	132	6.6	Singapore	324	7.5
South Korea	130	6.5	China	287	6.7

See "How to Get the Most Out of This Book" for definitions of the Country Groupings and an explanation of possible distortions in trade statistics for Canada.

SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA).

U.S. imports of telephone and telegraph equipment declined signficantly, from $4.29 billion in 1989 to $3.86 billion in 1990. The decrease in U.S. imports of telecommunications equipment can be attributed to a reduction in imports of small business telephone systems from the Far East as a result of an antidumping determination against manufacturers in Korea, Taiwan, and Japan, arising from a complaint filed by AT&T and Comdial.

Another factor contributing to the decrease in imports includes the shift in manufacturing operations by some foreign equipment manufacturers from overseas plants to the United States. The antidumping duties created an almost immediate reduction in imports of small business telephone systems and caused some of the manufacturers of those systems to establish U.S. production operations. In addition, trade frictions with Japan over the past two years led the United States Government to consider taking retaliatory trade action against certain telecommunications products from Japan. Although settlements were eventually negotiated in these disputes, some Japanese manufacturers have established manufacturing operations in the United States that will not be subject to trade sanctions if future disputes lead to retaliatory action.

U.S. trade in telecommunications equipment and services is also likely to be affected by EC 92, the merger of 12 Western European countries, which constitute a single market of 325 million people with a Gross Domestic Product of $4.5 trillion and a per capita income of $13,770 in 1988. Although not expecting to be fully operational until 1992, the EC member countries are already gearing up for competition with other world markets.

The principal thrust of the EC telecommunications program is the creation of a common internal market for telecommunications equipment and services; the degree to which EC harmonization and liberalization benefits will be available to third-country suppliers is not yet evident.

U.S. vendors of network equipment may benefit from an EC procurement directive that opens the EC telecommunications sector to competition, providing for transparency, public invitations to tender, and the use of European technical standards as of January 1, 1993. However, the directive allows authorities to exclude bids from non-EC countries where less than 50 percent of the services or supplies come from the EC, which apparently will limit its benefit to those U.S. suppliers involved in joint ventures with EC partners. The EC has proposed, in the context of the Uruguay Round of the General Agreement on Tariffs and Trade (GATT) talks, to more fully open its procurement market to foreign bidding if its major trading partners provide equivalent treatment. Thus, access by U.S. suppliers to the EC network equipment market (valued at $14 billion) will depend largely on the outcome of the GATT government procurement code renegotiation.

U.S. suppliers of customer premises equipment should benefit from the mutual acceptance of test data and type approval/declaration of conformity, because it should be easier to satisfy one set of requirements for the EC than to satisfy separate requirements for each member state.

Outlook for 1991

The outlook remains stable for telephone and telegraph equipment manufacturers. Product shipments, in constant dollars, are expected to increase slightly in 1991. Network equipment suppliers expect their customers' capital budgets to remain unchanged, but acknowledge that an economic downturn could result in cutbacks in projected spending levels. The rate of replacement of central office switching equipment in the local exchange carrier market will continue at a moderate pace. Slow or negative growth in mature CPE product markets will be offset by strong growth in other equipment categories, such as voice mail systems.

Network Equipment

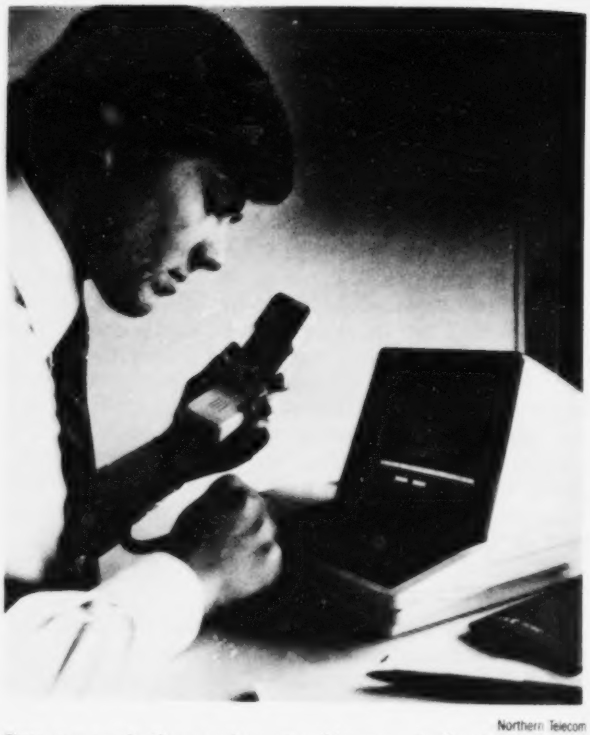
The Bell Operating Companies (BOCs), the independent telephone companies, and the interexchange carriers continue to modernize their networks, although at a slower rate than in years past. Thus, demand for network equipment is expected to increase only slightly in 1991. Overall shipments should remain at about $13 billion. Demand could decrease slightly if the U.S. economy stalls.

The market for digital switch equipment should remain at just under $5 billion in 1991. While AT&T and Northern Telecom Inc. continue to dominate the U.S. central office switch market, Ericsson, Siemens, and NEC are all expected to increase their market share for digital CO switching equipment in 1991. Vigorous competition for CO switch contracts is expected to hold prices down, depressing revenue growth in this product sector.

Customer Premises Equipment

Shipments of customer premises equipment are expected to increase about 2 percent in 1991 as demand for CPE remains strong. Product shipments in certain CPE categories are almost certain to expand as foreign-based equipment manufacturers shift production operations to U.S. plants and production operations come on line.

Shipments of PBXs are expected to decrease about 1 to 2 percent in 1991, as demand remains sluggish. A slowdown in the U.S. economy would result in a larger decrease, as businesses postpone major equipment outlays. Shipments of telephone sets should remain unchanged. Sales of other CPE products are expected to show positive growth rates.



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Data communications equipment and integrated voice data workstations will experience fairly strong growth rates in coming years.

Shipments of voice messaging equipment should continue to demonstrate strong growth, about 15 percent in 1991, as new technology makes these systems more attractive to users while lowering costs.

The market for automated call distributors (ACDs) also is expected to grow at a 15 percent annual rate in 1991. ACDs are intelligent call routing products that assist companies in directing and managing incoming telephone traffic. Technological innovation has resulted in the development of smaller and less expensive systems, which appeal to a larger group of users.

Long-Term Prospects

Telephone and telegraph equipment product shipments are expected to grow slowly but steadily during the next five years at an average annual rate of 2 to 3 percent (in constant dollars).

Shipments of customer premises equipment are forecast to increase at an annual rate of about 2 percent during the next five years. Shipments of telephone sets and key systems should benefit slightly from an influx of foreign manufacturing operations. A new generation of PBX systems, offering features such as ISDN and cordless technology, should breathe new life into this product area and generate a new round of equipment upgrades. Data communications equipment, integrated voice data workstations, and protocol converters will experience fairly strong growth rates.

The Bell operating companies and other local exchange carriers will continue to upgrade their networks, and the rate of replacement of existing electronic and electromechanical switches is expected to increase through the mid-1990s. Digital central offices permit telephone companies to offer subscribers new revenue-producing services (speed-calling, conferencing, caller identification, call-forwarding, call-waiting, and automatic answering) economically, providing end-users with an alternative to investing in CPE to perform these functions. The acceptance of these service offerings, as evidenced by increased demand in the past two years, promises strong growth in shipments of digital switching equipment.

Local service providers will respond to customer needs for low-cost, enhanced services available through simultaneous voice/data transmission capabilities. Expanded digital facilities in the industry will improve performance, reduce costs, and provide opportunities for the development of new services. The BOCs will look both to foreign and domestic manufacturers for equipment that will best enable them to offer these low-cost, enhanced services. Central office-based LANs may be a key product offering of the BOCs.

Software will be a vital part of the new communications equipment responsible for the control, processing, and monitoring functions of networks. Emphasis will be on flexibility and cost. Manufacturers will not wait to design equipment to meet future international standards, but will implement flexible architectures that can be economically modified to meet new standards at minimal additional cost. CPE manufacturers will strive to include greater intelligence and processing capabilities in their products than is available through the public switched network.

This digital evolution—together with the demand for local data networks, "office of the future" systems, satellite communications, mobile radio networks, lightwave systems, and sophisticated terminal equipment—will continue to provide a large market for manufacturers of telephone and telegraph equipment. These technologies will be combined with common carrier service offerings through the various networks to provide a user-controlled package of business services. In addition, programs by other developed countries to convert to integrated digital systems could lead to increased exports by U.S. firms as market access opportunities continue to improve.

Employment in the telecommunications equipment industry is expected to decline slightly over the next five years. New technology and workplace changes should continue to result in greater worker productivity. Growth in new market sectors should help to offset declines due to increased competition in mature product and service markets.—*John Henry, Office of Telecommunications, (202) 377-4466, September 1990.*

Additional References

(Call the Bureau of the Census at (301) 763-4100 for information about how to order Census documents.)

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Telephone Engineer and Management, 111 E. Wacker Drive, Chicago, IL 60601. Telephone: (312) 938-2378.

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Network World, 161 Worcester Road, P.O. Box 9172, Framingham, MA 01701. Telephone: (508)875-6400.

Telecommunications Industry Service, Dataquest, 1290 Ridder Park Drive, San Jose, CA 95131-2398. Telephone: (408) 971-9000.

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31

Radio Communication and Detection Equipment

Manufacturers of radio communication and detection equipment, which includes radio and television broadcasting and communication equipment (SIC 3663), other communications equipment (3669), and search and navigation equipment (3812), are expected to increase their shipments by a modest 2 percent in 1991. This is about the same rate of growth as in 1990. Growth will continue to be driven by U.S. government, especially military, contracts. International trade, although growing, is of minor importance to the industry.

Growth in the radio communication and detection equipment industry slowed in 1990, reflecting continuing pressures to reduce the size of the U.S. budget deficit, as well as dramatic changes in the geopolitical climate. Product shipments by the industry rose about 2 percent in constant dollars, to about $59.8 billion in current dollars. Although no current data are available, shipments to Federal Government agencies are believed to account for nearly half of total shipments.

Before reading this chapter, please see "How to Get the Most Out of This Book" on page 1. It will clarify questions you may have concerning data collection procedures, factors affecting trade data, forecasting methodology, the use of constant dollars, the difference between industry and product data, sources and references, and the Standard Industrial Classification system (SIC). For other topics related to the subject of this chapter, see chapters 22 (Aerospace), 29 (Telecommunications Services), 30 (Telephone and Telegraph Equipment), 32 (Entertainment), and 42 (Space Commerce).

By far the dominant category in this industry, accounting for more than 60 percent of all product shipments, is search, detection, navigation, guidance, aeronautical, and nautical instruments (search and navigation equipment). These products include radar and sonar systems and equipment, navigation systems and equipment, light reconnaissance and surveillance systems and equipment (e.g. infrared and ultraviolet), and electronic warfare equipment. Shipments of these products grew about 3 percent, from $35.5 billion in 1989 to about $36.6 billion in 1990.

Traditionally, domestic demand for search and navigation equipment has stemmed primarily from large-scale, often long-term Government procurements and new military applications. This market stagnated in 1990 due to budgetary pressures, as well as the reduction of defense communications needs resulting from the changing political climate in Eastern Europe and the Soviet Union in late 1989 and 1990. Demand from civilian and foreign markets helped fill the gap.

The next largest category, representing about 27 percent of total product shipments by this industry, is communication systems and equipment, except broadcast. This category includes fiber optic systems, microwave and satellite communication systems, paging equipment, and mobile communications systems. Shipments increased 11 percent, from $13.8 billion in 1989 to an estimated $15.0 billion in 1990. This is the fastest growing segment of the radio communication and detection equipment industry (Figure 1). Leading growth

Trends and Forecasts: Radio Communication and Detection Equipment (SIC 3663, 3669, 3812)

(in millions of dollars except as noted)

Item	1987	1988[1]	1989[2]	1990[2]	1991[3]	Percent Change 1987-88	1988-89	1989-90	1990-91
Industry Data									
Value of shipments[4]	52,665	54,788	—	—	—	4.0	—	—	—
Value of shipments (1987$)	52,685	53,227	54,733	55,828	56,944	1.0	2.8	2.0	2.0
Total employment (000)	517	516	—	—	—	−0.2	—	—	—
Production workers (000)	228	226	—	—	—	−0.9	—	—	—
Average hourly earnings ($)	13.20	13.76	—	—	—	4.2	—	—	—
Capital expenditures	2,126	2,132	—	—	—	0.3	—	—	—
Product Data									
Value of shipments[5]	49,399	52,807	—	—	—	6.9	—	—	—
Value of shipments (1987$)	49,399	51,310	—	—	—	3.9	—	—	—

[1] Advance data from the 1988 Annual Survey of Manufactures.

[2] Estimate.

[3] Forecast.

[4] Value of all products and services sold by establishments in the radio communication & detection eq industry.

[5] Value of products classified in the radio communication & detection eq industry produced by all industries.

SOURCE: U.S. Department of Commerce: Bureau of the Census. International Trade Administration (ITA). Estimates and forecasts by ITA.

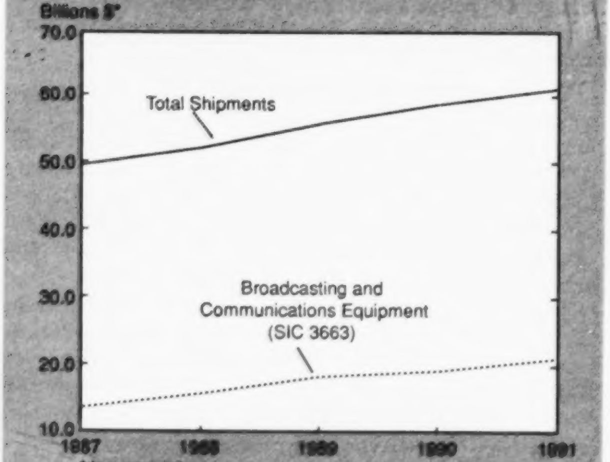
areas include cellular, mobile, and satellite communications systems.

Broadcast, studio, and related electronic equipment includes audio and video broadcast equipment, cable television (CATV) equipment, RF power amplifiers, studio transmission links, and closed-circuit television (CCTV) equipment. Shipments of this equipment remained steady at about $1.9 billion in 1990. This category represents approximately 3 percent of all product shipments by the radio communication and detection equipment industry.

Alarm systems, traffic control equipment, and intercommunication systems include intrusion detection, fire detection and prevention, traffic and railway signal, and intercom equipment. Combined product shipments, which account for nearly 4 percent of the industry total, were steady at about $2.1 billion in 1990.

Figure 31-1

Growth of U.S. Radio Communication and Detection Equipment Industry



* In current dollars.

Source: U.S. Department of Commerce, Bureau of the Census.

The group of products known as electronic systems and equipment not elsewhere classified (NEC), includes electronic kits, ultrasonic equipment, particle accelerators, electronic trainers and simulators, and laser systems and equipment. Product shipments remained steady at about $3.8 billion in 1990. This category represents nearly 7 percent of the industry total.

Ten to 15 U.S. firms continued to dominate shipments by the radio communication and detection equipment industry. Many firms announced significant layoffs in response to declines in orders from the U.S. military. However, many of the planned layoffs were delayed pending the outcome of the Persian Gulf crisis. Business acquisitions and mergers continued as companies that had been dependent on U.S. military contracts sought to diversify.

INTERNATIONAL COMPETITIVENESS

International trade is not a driving force in this industry. Exports amounted to about 10 percent of product shipments in 1990, up from 8 percent in 1989. Import penetration as a whole is relatively insignificant. In 1990, total imports were about 6 percent of new supply (defined as domestic product shipments plus imports), about the same ratio as in 1989.

U.S. Exports and Imports

Radio Communication and Detection Equipment

(in millions of dollars except as noted)

SIC	Industry	1989	1990[1]	1991[2]	Percent Change 1989–90	Percent Change 1990–91
3663	Radio & TV communications equipment					
	Value of exports	2,735	4,000	–	46.3	–
	Value of imports	2,339	3,000	–	28.3	–
3669	Communications equipment, NEC					
	Value of exports	149.1	–	–	–	
	Value of imports	204.6	–	–	–	
3812	Search and navigation equipment					
	Value of exports	1,960.0	–	–	–	
	Value of imports	704.1	–	–	–	
TOTAL						
	Value of exports	4,844	6,100	6,200	25.9	1.6
	Value of imports	3,248	3,800	3,900	17.0	2.6

[1] Estimate

[2] Forecast.

SOURCE: U.S. Department of Commerce: Bureau of the Census, International Trade Administration (ITA). Estimates and forecasts by ITA.

Exports of the industry rose about 21 percent from nearly $5.0 billion in 1989 to an estimated $6.1 billion in 1990. Imports of radio communication and detection equipment increased to an estimated $3.8 billion in 1990, up nearly 3 percent compared with $3.7 billion in 1989.

Radio and television broadcasting and communication products (SIC 3663) dominate international trade, accounting for more than 60 percent of exports and about 75 percent of imports in 1990. Search and navigation products (SIC 3812) followed, with 30 percent of exports and 20 percent of imports.

The major foreign markets in 1990 were Canada, 11 percent; Japan and the United Kingdom, 10 percent each; Mexico, 9 percent; and Germany and Brazil, 4 percent each. These six countries accounted for nearly half of total U.S. exports. The most significant product exports were parts for radio telegraphic and telephonic equipment, accounting for 17 percent of the total; communications satellites, 12 percent; parts for radar, 7 percent; radio and television transmitters (not elsewhere specified) 6 percent; and radio transmitters over 400 MHz and radar, 5 percent each.

For imports, Japan continued to be the largest foreign supplier in 1990, accounting for nearly 30 percent of the total. The next most important sources of imports were Canada, 11 percent; Mexico, 8 percent; Taiwan, 6 percent; and Korea, 5 percent. These five countries accounted for nearly 70 percent of total imports. The major products purchased from abroad are cable and closed-circuit television equipment, 13 percent; transmitters, 10 percent; parts for radio telephonic and radio telegraphic equipment, 9 percent; and cellular telephones, 7 percent.

Outlook for 1991

The value of industry shipments by this high-technology industry should increase about 2 percent, in constant dollars.

U.S. Trade Patterns in 1989
Radio Communication and Detection Equipment
SIC 3663, 3669, 3812
(in millions of dollars, percent)

Exports			Imports		
	Value	Share		Value	Share
Canada & Mexico	878	18.1	Canada & Mexico	629	19.4
South America	553	11.4	South America	14.3	0.4
European Community	983	20.3	European Community	270	8.3
East Asia NICs	477	9.9	East Asia NICs	943	29.0
Japan	571	11.8	Japan	924	28.5
Other	1,381	28.5	Other	468	14.4
World Total	4,844	100.0	World Total	3,248	100.0

Top Five Countries

	Value	Share		Value	Share
Japan	571	11.8	Japan	924	28.5
United Kingdom	492	10.2	Canada	361	11.1
Mexico	457	9.4	Taiwan	338	10.4
Canada	422	8.7	Mexico	268	8.3
Brazil	295	6.1	South Korea	160	4.9

See "How to Get the Most Out of This Book" for definitions of the Country Groupings.

SOURCE: U.S. Department of Commerce: Bureau of the Census, International Trade Administration (ITA).

Domestic demand for military electronic equipment should decline further in response to budgetary constraints, but may be partially offset by new demand arising from the Persian Gulf situation. Exports of radio communication and detection equipment should increase moderately, while imports increase slightly.

Long-Term Prospects

Technological Developments

The 1990s hold great promise for new improvements in search and navigation technology. Two of the latest developments—advanced phased array radar and laser radar—appear to be the most advanced technological improvements in the radar industry, as well as the most promising.

Advanced phased array radar, an active electronically scanned array (ASEA), will not only perform the traditional search and detection functions associated with conventional radar, but also could potentially support other radio frequency (RF) functions such as wider bandwidth and greater beam agility. Although the concept of electronically scanned arrays has been understood since World War II, the development of the transmit/receive (T/R) module in the 1980s allowed ASEA to become a viable alternative to mechanically scanned systems. The most important characteristics of an ASEA—and its advantages over conventional radar—include greater reliability through "graceful degradation," reduced radar cross section (RCS), lower probability of intercept and electronic beam agility.

Laser radar (LADAR) also holds promise. The range-imaging laser radar combines conventional radar and video imaging with capabilities that include the best features of both systems. A LADAR system operates by shooting a beam of laser light toward a target while simultaneously starting a timer. The light hits the target and reflects back to the sensor, and the timer stops. The onboard computer remembers the time of transit and position of each return pulse. The computer then converts this information into a false color three dimensional range image in which the target appears in a multicolored field. The field carries gradients and changes in color to indicate distances. LADARs are useful where target recognition requires both range and image. The combination allows the operator to better differentiate between a real target and a decoy. Range-imaging LADAR could have applications in conventional weapons systems that perform automatic target recognition or aimpoint refinement. It also has potential civilian applications in robotic vision, collision avoidance, and autonomous vehicle-control systems.

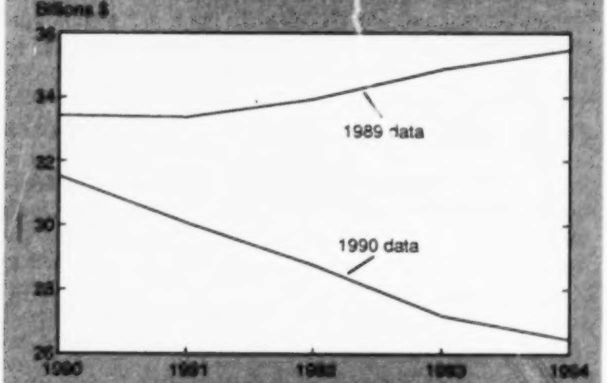
Defense Communications

The performance of the radio communication and detection equipment industry is highly dependent on its dominant segment, search and navigation equipment. Domestic demand for search and navigation equipment is expected to remain flat for the foreseeable future, due in part to the Defense Department's objective of reducing expenditures 25 percent by 1995. Most domestic demand will consist of upgrading defense and early warning systems already in use by the U.S. military. The development of new Stealth technology, as well as the expected production and deployment of the Advanced Tactical Fighter (ATF), have created several advancements in radar and radar-related equipment. Search and detection systems used in aircraft such as the B-2 and the ATF may be used in other aircraft as well as naval vessels in the near future. Conversion from two dimensional to three dimensional radar, advances in gallium arsenide (GaAs) technology, and the increased use of advanced-phased array radar systems as well as laser radar are expected to result in the replacement of conventional, mechanically scanned radar systems now in place. Upgrading of current search and navigation systems with new, state-of-the-art defensive technology will probably make up the bulk of domestic demand for this part of the industry for at least the first half of the 1990s.

New demands in the international market could partially offset any decrease in domestic demand. The changing geopolitical climate may allow new markets to open for the defense communications industry. The Coordinating Committee on Multilateral Export Controls (COCOM) will probably further relax export restrictions on sales of radio communication and detection products to Central and Eastern Europe as countries in these regions continue to enact political reforms and move closer to market-oriented economies. Many of these countries are in dire need of improved aviation and communications equipment to replace their antiquated systems.

Furthermore, procurement of search and navigation equipment within countries belonging to the North Atlantic Treaty Organization (NATO) should still provide a viable market, at least in the short-term. Although NATO may be experiencing some "adjustment problems" as it adapts to the changes occurring in Europe, several projects are expected to receive approval for deployment in the near future. For example, invitations for firms to bid on the multibillion dollar Air Command and Control System (ACCS) are still expected to be released, although the offensive capabilities (targeting incoming enemy aircraft, for example) will probably be reduced. ACCS will allow many NATO countries to update their aging command and control (C2) systems, providing U.S. firms the opportunity to bid on potentially lucrative

Figure 31-2
Projected Defense Expenditures for Radio and TV Communications: 1990-1994



Note: Data is in billions of 1988 dollars. The 1989 data is from the *Projected Defense Purchases Detail by Industry and State CY 1989-1994,* Department of Defense and represents projections made before the collapse of the Berlin Wall. The 1990 data is from a study conducted by the U.S. Department of Commerce, Bureau of Export Administration and represents projections made before the Persian Gulf crisis.

contracts for radar systems and related search and navigation equipment.

Until recently, the consensus was that over the next five years there would be a gradual shift away from the domestic market toward the international market for search and navigation equipment, as a result of defense cuts. However, the Persian Gulf crisis cast doubt on any long-term forecasts for the radio communication and detection equipment industry (Figure 2). Operation Desert Shield could spark renewed increases in domestic defense spending, particularly if present short-term U.S. military maneuvers in the Gulf become a long-term U.S. commitment.

Firms in the communications and electronics fields may be least affected by defense cuts. A majority of the cuts proposed are geared toward nuclear weaponry and strategic hardware that most communications and electronics firms do not directly manufacture. However, given the Defense Department's objective of reducing the defense budget 25 percent by calendar year 1995, it is safe to say that all firms with interests in the defense field will feel the effects of smaller defense budgets.

Before the tumultuous political upheavals in Eastern Europe that began in late 1989, defense purchases of radio communication and detection equipment were projected to remain relatively stable during the first half of the 1990s. Future spending on these products was expected to increase by a modest average of almost 0.5 percent annually between 1988 and 1994. Projections made after the events in Eastern Europe, however, predict a different scenario. Based on 1990 data, defense expenditures for radio communication and detection equipment are expected to decline by an average of 2.62 percent annually for the years 1991 through 1994. These figures indicate that even relatively stable and secure defense sectors such as the radio communications and detection equipment industry will be adversely affected by the impending reductions in defense spending.

As the U.S. defense budget shrinks, domestic defense markets will become tighter. Communications firms have begun to look toward the international and civilian markets for new contracts in radio communication and detection equipment. Many countries in regions such as South America, Southeast Asia, Southern Europe, and especially Central and Eastern Europe, are in desperate need of modern communications equipment as they begin to upgrade their civilian aviation and communications systems. Firms formerly involved in defense communications may welcome these new civilian markets for aviation and nautical equipment as the domestic defense market becomes smaller. However, the military action taken by the U.S. in the summer of 1990 in the Persian Gulf (Operation Desert Shield) may distort all present defense expenditure predictions. If U.S. forces remain in the Gulf after the current crisis is resolved, there may be a call for renewed increases in defense expenditures in the 1990s.

The Civilian Market

The evolution of the next generation of wireless communications services, spurred by the application of digital radio transmission techniques in 1990, is likely to generate strong new demand for radio communications equipment over the next 5 to 10 years. However, the development and subsequent growth of this market depends on the timely resolution of key technological, spectrum allocation, and licensing issues.

The implementation of digital cellular in 1991-92 will be the first major step in the evolution of mobile communications services. Even before digital cellular is implemented, the industry is turning toward the next generation of wireless, or "personal," communications. In the longer term, digital cellular may serve as the basis for integrating several existing and future cellular, paging, cordless, and even satellite services that are not efficiently networked today.

Dozens of companies in the United States, Europe, and Japan are investing large sums to develop novel types of mobile communications services. Although all the services are wireless, each employs a different technical method and different network structure. The two services receiving the most attention from manufacturers and service providers are personal communications networks (PCNs) and Telepoint (CT-2). Both target market opportunities growing out of the relatively high cost of today's cellular service.

In PCNs, the subscriber loop is replaced by low-power digital radio links in "microcells" about 200 meters in radius. The small radius permits the use of extremely low-power portable handsets—10 milliwatts, compared with 600 and 3000 milliwatts for current portable and vehicular cellular phones, respectively. The low-power requirement of PCNs means smaller batteries and microminiaturized components that will make possible pocket phones about two-thirds the size of the smallest portable cellular phones available today.

PCNs are designed to serve users on the street, and in offices and homes. However, they will not be capable of serving vehicular users, and will be uneconomical in low-density rural areas because of the high number of microcells required to cover large areas. As a result, PCNs will be both complementary and competitive with cellular, which is nationwide and effectively handles vehicular users.

The British initiated the PCN concept and have licensed three operators to begin service by the end of 1992. The operators intend to use a variant of Europe's digital cellular technology adapted for 1.8 GHz. In the United States, potential operators are evaluating the technical and economic feasibility of PCN service, and have submitted 11 applications for experimental licenses to the Federal Communications Commission (FCC). U.S. PCN proponents are exploring a variety of technical alternatives. The most promising thus far appears to be a type of spread-spectrum technology known as Code Division Multiple Access (CDMA), which was originally developed by the U.S. military to protect radio communications. CDMA, which is also being considered for digital cellular and CT-2, claims very high call-carrying capacity (20 times that of analog cellular) while being able to coexist on the same spectrum as other services. It operates by transmitting a series of voice signals simultaneously in bursts spread over a wide bandwidth and assigning each burst a unique binary code. The receiver sorts the bursts by code and reconstructs the intended voice signals. The pioneer of CDMA, Qualcomm, recently signed a joint venture with the French radio giant, Alcatel, to promote CDMA spread-spectrum in Europe.

CT-2, or telepoint, refers to a related but much smaller scale service also under development, based on digital cordless technology. CT-2 users will carry their pocket terminals to within 200 meters of transmission points located in public areas (streets, shopping malls, etc.) in order to place outgoing calls that will be billed to the user's home or office; incoming calls cannot be received. Telepoint service was pioneered in the United Kingdom, where the public pay phone network is limited, but is also attracting serious interest in Scandinavia, France, Germany, and Hong Kong. Service is scheduled to begin in 1992 in the U.K., where four operators have been licensed in the 800-900 MHz band using the Frequency Division Multiple Access (FDMA) variant of digital radio transmission technology. Because the technical specifications and coverage requirements are comparatively simple, CT-2 service will be far less expensive to implement than both cellular and PCN. Ten CT-2 trials have been proposed in the United States.

The FCC is receiving a continuing flow of requests (a combined total of 24 as of September 1990) for permission to experiment in the realm of personal communications services, including enhanced Specialized Mobile Radio (SMR) and PCNs and CT-2. These proposals, which will examine propagation and interference phenomena, provided the impetus for the FCC to initiate a broad, full-fledged inquiry into the future of personal, mobile communications services in the United States in June 1990. The single most important issue affecting the introduction of these new services in the United States is spectrum allocation. Given the scarcity of spectrum, the FCC will examine the need for alternative services in the mobile communications sector. The FCC has already approved several experimental licenses for these services. Some trials will take place on cellular spectrum, while others will utilize spectrum at 1.8 GHz. The experimental licenses allow up to two, and in some cases three, years to construct the system. Although there are no guarantees that any of the new services will be authorized, market pressure is likely to force a final decision on type of service, spectrum allocation, the number of operators, eligibility requirements and geographic scope by the end of 1991. The inquiry will not affect the experimental licenses.

Internationally, the Consultative Committee on International Radio (CCIR) has proposed spectrum allocation of 227 MHz in the 1-3 GHz range for these new services by 1998. The U.S. would have to move or subordinate existing users in order to meet this proposal, a process likely to encounter considerable resistance.

If sufficient spectrum can be found, mobile and other wireless technologies are likely to play a leading role in stimulating communications product and service differentiation—and overall market growth—in the 1990s. These services are certain to attract the mass market that has proved elusive to analog cellular. In so doing, the radio communications market will experience simultaneous disruption and improvement. Operators, manufacturers, and users will benefit as the market expands to encompass a wider variety of price versus performance options. The challenge will be integrating and merging these services into a cost-effective and perceptively seamless transmission network.

The following sections of this chapter review the major developments and outlook of four of the most dynamic nonwireline communications technologies—satellite communications systems, cellular radiotelephone systems, microwave systems, and fiber optics. These profiles provide useful insights into industry trends.—*Linda L. Gossack and Anthony J. Mocenigo, Office of Telecommunications, (202) 377-4466, October 1990.*

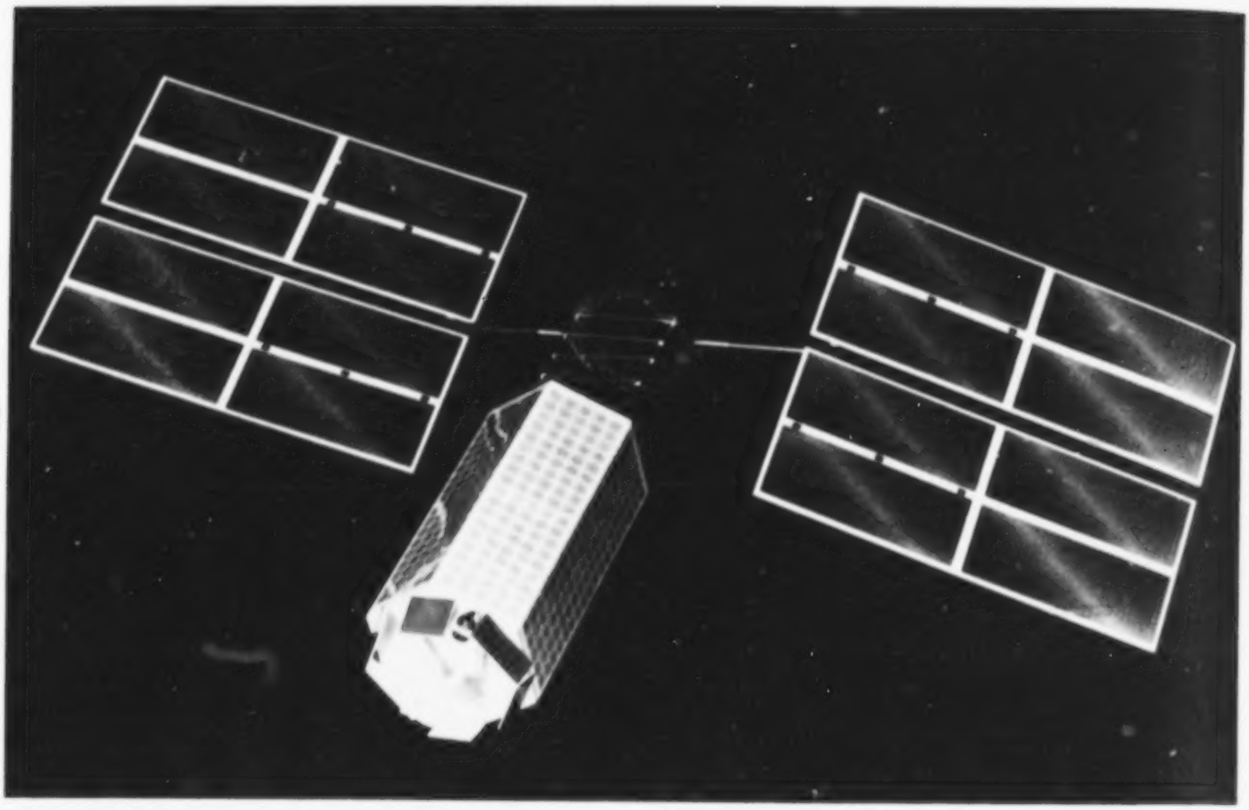
SATELLITE COMMUNICATIONS SYSTEMS

Strong international demand and the return of viable and competitively priced launch vehicles worldwide spurred the U.S. communications satellite industry to renewed growth in 1990. Production of complete space communications satellite systems (SIC 36631.38) rose about 5 percent in 1990 to more than $2.7 billion, following a 4 percent increase in domestic production in 1989. Satellite communications systems consist of a space segment—the communications satellite that both receives and transmits signals—and a ground segment—which includes earth stations for both transmitting and receiving signals, and equipment for tracking, telemetry, and control (TT&C).

Space Segment

U.S. satellite manufacturers delivered nine communications satellites in 1990, all for export, at an estimated net value of $1 billion. With only eight satellites scheduled for delivery in 1991, revenues are expected to dip slightly next year to around $800 million.

Exports of communications satellites far outstripped imports in 1990, and the U.S. industry's longstanding reputation as the world leader in satellite technology should ensure a healthy trade surplus through the mid-1990s. International demand for communications systems will remain strong, with 51 satellites currently on order worldwide between 1991 and 1993. Among the major satellite projects on line are updates for existing domestic satellite systems for the European Community (EUTELSAT 2),



Motorola's Iridium system is based on a constellation of 77 satellites in low earth orbit that use cellular technology to communicate with users on earth. The U.S. cellular market is expected to experience steady growth in 1991.

Australia (AUSSAT 2), and Mexico (MORELOS 3), as well as completely new satellite systems on line for Turkey, Spain, Pakistan, South Korea, Thailand, and Brazil. The International Satellite Organization (INTELSAT) is also contracting for the next generation of satellites, and currently has orders with U.S. manufacturers for nine satellites over the next three years, with options for five more. The International Maritime Satellite Organization (INMARSAT) also is looking at a new generation, the INMARSAT 3 series, in the coming years.

Including the 16 satellites and three ground spares planned by the seven domestic operators, U.S. firms have contracts to build 29 satellites, for a 57 percent share of worldwide satellite orders in 1990. The U.S. is followed in market share by France with 17 percent and the United Kingdom at 10 percent. However, in the next five years, U.S. industry can expect increased competition from well-established French and British firms, as well as from Japanese, Soviet, and possibly Chinese manufacturers now expressing interest in entering the market.

The trend toward higher power and higher frequency, communications satellites will continue in the next five years, with increasing numbers of satellites featuring Ku-band transponders, as well as the more traditionally used, lower power C-band. The National Aeronautics and Space Administration (NASA) estimates that by the mid-1990s, the number of Ku-band transponders in orbit will be double those at the C-band. Higher frequency satellite transmission carries the advantages of less terrestrial interference from microwave systems, smaller and therefore less costly earth station equipment, and more cost-effective networking capabilities.

Interest in commercial development of smaller, lighter satellites figured prominently in projects proposed in 1990. These satellites, called "lightsats," carry only 3 to 10 transponders (compared with the 24 to 36 transponders carried by most larger satellites), weigh less than 1,000 pounds, and are generally launched into low earth orbits (LEO), though some are launched for geostationary orbit. Low-orbiting satellites also require smaller antennas, allowing the receiving units for such systems to shrink to as small as handheld size.

The U.S. military dominates the lightsat market, with 11 launches in 1990 and NASA proposing to launch 2 scientific lightsats yearly for the next five years. However, because lightsats are quicker and cheaper to produce (as low as $5 million for 10 transponders) and are more easily launched, many new commercial applications are now being proposed. Five companies filed in 1990 to operate lightsats, although none are scheduled for launch until the mid-1990s.

While Motorola had not yet filed with the FCC, it announced an innovative satellite-cellular telephone system called Iridium in June 1990, planned for full service in 1996. The proposed system would include as many as 77 LEO satellites to provide digital switching for worldwide mobile communications. Proposals such as Iridium promise a continuous market for lightsat manufacturers, with obvious benefits to the overall industry outlook.

In the developing world, lightsats have been discussed as viable alternatives to cable systems in upgrading domestic telecommunications. In particular, African nations, the Andean countries in South America, and the Pacific Island nations are likely candidates for light satellite systems in geostationary orbit.

Longer-term prospects for the communications satellite industry are buoyed by domestic opportunities for replacing the current generation of communications satellites, most of which will reach the end of their expected lifespan by the mid-1990s. With the proliferation of domestic satellite systems planned by developing countries, market opportunities for U.S. manufacturers continue to arise from international orders. Future growth will be influenced largely by the following factors: (1) new orders from INTELSAT and foreign governments; (2) the success of proposed new satellite services, such as direct broadcast television and mobile satellite services; (3) changes in the regulatory climate regarding the interconnection of separate satellite systems (i.e., non-INTELSAT) to public switched telephone networks; and (4) the continued availability of adequate launch vehicles.

Ground Segment

Industry estimates of the domestic earth station market in 1990 vary widely, from $450 million to as high as $1.1 billion, and no official trade or production data are compiled for this segment as a whole. The U.S. Department of Commerce estimates the market at $860 million in 1990, up about 15 percent from 1989. Earth station sales are expected to accelerate throughout 1991, spurred by three leading growth areas: Very Small Aperture Terminals (VSATs) and its emerging corollary, the Ultra Small Aperture Terminal (USAT); the Television Receive-Only (TVRO)/Direct Broadcast market; and the mobile satellite market. On the other hand, sales of earth stations for broadcasting and cable television (CATV) applications will likely decline from around $220 million in 1990 to $170 million in 1994, as these products reach the mature phase of the production cycle.

The domestic market for VSAT systems in 1990 was brisk, with growth in revenues predicted at around 20 percent annually over the next three years. Private VSAT networks, consisting of a hub station and as many as 5,000 antenna dishes as small as 1.2 meters in diameter, are said to cost 50 percent less than leasing lines from public switched networks. In particular, VSAT systems appeal to the business community for internal data communications, training, video conferencing, and voice-telephone needs. Around 160 VSAT systems were operational in 1990, with some 180,000 private satellite network earth stations planned for installation by 1992.

In the longer term, major VSAT networks can be expected to be brought on-line at the rate of 10-to-15 annually for the next five years, bringing in equipment revenues of $1.7 billion by 1995. Interactive VSAT sales will become the major market force in earth station sales, with the potential market for both VSAT antenna and hubs estimated at some 300,000 units by 1995. The introduction of flat, rather than parabolic, antennas, now widely available in Japan, will further aid the growth of VSATs in the United States, as these antenna are more amenable to local zoning regulations. As the VSAT market for major corporate end-users becomes saturated, longer term U.S. market opportunities will shift to smaller and mid-sized companies. Prices will tend downward as fierce competition in the VSAT market exerts pressure.

While no official data are available, exports of VSAT equipment remain limited, as around 90 percent of all installed VSATs worldwide are in the United States. Public telephone operators in Western Europe have generally resisted the market erosion VSAT networks would pose, and regulatory procedures have been prohibitive to the development of VSAT networks there. However, the United Kingdom allows licensed VSAT operators, and West Germany's deregulation of private satellites in June 1990 may present new market possibilities for VSAT manufacturers, as well as provide a positive example for the remaining European markets. Additionally, VSAT systems are becoming increasingly attractive in developing countries as a cost-effective and expedient means to bypass inadequate local telephone networks.

Some 2.7 million TVROs were in use in the United States in 1990, receiving television signals directly in the home. This 15 percent increase over 1989 largely reflects sales to rural or remote areas where CATV is not readily available. Leading industry estimates place 1990 home satellite TVRO sales at around 380,000 units, for a total market value of just under $400 million. The average cost of a TVRO unit (excluding the descrambler and installation costs) was about $1,000 in 1990. The TVRO industry appears to have recovered from the initial dampening effects of widespread satellite signal scrambling. Three factors have contributed to this recovery: (1) the increased availability of package programming; (2) reduction in the cost of programming to rates comparable to or lower than cable subscriber rates; and (3) the apparent end of the shortage of decoders. Growth in unit sales can be expected to continue at around 10-to-15 percent annually for the next three years.

The TVRO market will grow if plans to initiate Direct Broadcast Service (DBS) are realized. DBS, or pay television transmitted directly to the home, offers more video channels at potentially lower cost than CATV, as well as higher quality voice and video than traditional cable broadcasts. DBS is widely available in Japan and parts of Europe, but is still only in the planning stages in the United States. In the United Kingdom, British Satellite Broadcasting estimates that its DBS services will spur demand for around 10 million additional TVRO receivers over the next five years. However, many European countries prohibit private ownership of TVROs if business TV or data are also transmitted, effectively blocking that market from prospective U.S. entrants.

In the United States, DBS implementation has suffered from the pervasive availability of CATV, as well as high start-up costs. The Federal Communications Commission (FCC) has granted nine U.S. companies conditional permits for high-power, "true" DBS services, operating on the Ku-band with downlinks between 12.2 GHz and 12.7 GHz on frequencies dedicated solely for direct broadcast satellites. The first high-power DBS system is slated for launch in 1993, with two lower-power DBS systems planned for early 1991.

In 1990, Congress expressed an interest in "re-regulating" the CATV market to encourage competition and to ensure access to programming by alternative multichannel applications, including DBS services. Although the move failed, the perceived monopoly of the CATV industry is likely to come under renewed scrutiny in 1991, providing additional impetus for DBS.

The wide range of new Mobile Satellite Services (MSS) also will spur earth station sales as these services come on-line. Some proponents predict that more than 10,000 MSS transceivers will be operating in the United States by 1993, with the number of marine mobile terminals installed shipboard reaching around 17,000 by 1995. In 1990, the FCC opened the way for aircraft MSS terminals to provide in-flight telephone service. Two groups have proposed to offer in-flight telephone service via INMARSAT—Skyphone, a British firm, and GTE Airfone in conjunction with COMSAT. The planned launch of two satellites in 1992 and 1993 by American Mobile Satellite Corporation, a consortium of satellite manufacturers and operators, should stimulate sales of small transceivers that can be mounted on boats, trains, planes, trucks, and automobiles and, in some cases, be handheld.

Proponents of Radio Determination Satellite Services (RDSS), a mobile service that uses satellites for radio navigation and digital messaging, predict that 150,000 of the receiving units will be in operation by the end of 1991. With the expansion of vehicle tracking and messaging services such as those provided by two U.S. companies, Qualcomm and Geostar, the market for compatible receiving units is likely to increase modestly in the short term.

Foreign Trade

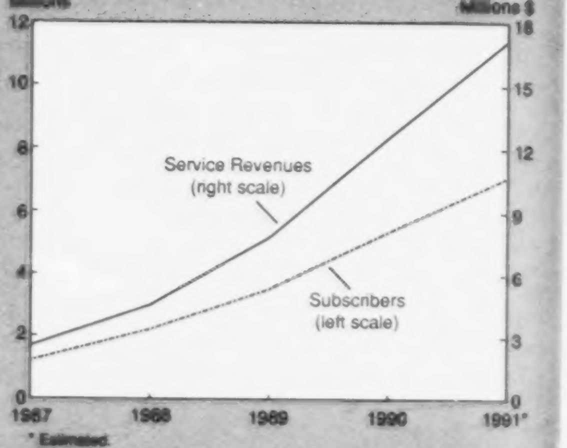
U.S. exports of satellite communications antennas rose from $40 million in 1989 to an estimated $47 million in 1990. With continued yearly growth at 8 percent, exports should exceed $50 million in 1991. The expansion of satellite broadcasting capacity in Europe and increased use by Third World countries of satellites for domestic communications will drive growth in this market. European initiatives to liberalize satellite communications also should boost U.S. exports in the longer term.—*Patricia A. Cooper, Office of Telecommunications, (202) 377-4466, October 1990.*

CELLULAR RADIOTELEPHONE SYSTEMS

The U.S. cellular market continued to experience impressive gains in 1990, despite some expectations that the economic downturn in many end-user industries might dampen growth. Even as the cellular industry moves closer to completion of a truly nationwide network, the challenge and opportunity of replacing current systems with new digital technology lies ahead as a necessity to alleviate capacity shortages and permit future growth. The analog to digital conversion will be the biggest technological transition in this industry's relatively brief history.

According to the Cellular Telecommunications Industry Association, the number of subscribers reached 4.4 million as of mid-1990. With a growth rate of more than 140,000 new subscribers per month (up 40 percent over 1989), the number should grow to about 5.2 million subscribers by the end of 1990, for an annual increase of almost 50 percent. Cumulative capital investment grew 16 percent in 1990, approaching $6.0 billion. This increase is due to the ongoing costs of expansion in metropolitan areas, as well as new system construction in rural markets.

Figure 31-3
Growth of U.S. Cellular Telecommunications Market



* Estimated.
Source: U.S. Department of Commerce, Bureau of the Census; Cellular Telecommunications Industry Association.

By mid-1990, 592 systems were in operation. Both of the two licensed carriers authorized by the FCC in each market were operating in all 305 metropolitan areas, serving about 75 percent of the U.S. population. The cost of local cellular service declined 6 percent in 1990 to an average of about $85 per month, and the length of the average cellular call was 2.3 minutes.

Based on the number of new subscribers, revenues from equipment sales are estimated at between $2.75 billion and $3.0 billion in 1990, an increase of about 35 percent over 1989. Estimated service revenues in 1990 reached about $5.2 billion, up more than 55 percent since 1989.

Motorola, AT&T and, to a lesser extent, Northern Telecom and Ericsson continue to dominate the market for cellular infrastructure equipment. Northern Telecom made notable gains in 1990, becoming the third largest supplier with nearly 100 systems. The focus of all system vendors has turned to networking larger regional systems, planning for the introduction of digital cellular systems, and tapping rural markets. Market share positions over the next few years are likely to change as a result of both intersystem handoff (see below), which allows companies for the first time to overlay equipment on systems supplied by different manufacturers, as well as the conversion to digital cellular.

In the cellular subscriber equipment market, cellular phone prices dropped sharply in 1990 as cellular moved further into the retail market. In addition, major U.S. auto manufacturers announced plans to begin factory installation of cellular phones. Prices for new mobile units now average about $400. Similarly, average prices for portables dropped to about $800. The continued narrowing of the price differential between mobile- and portable-type units has increased penetration of portables in the market. Portables comprise an estimated 15 percent of total sales, up from about 5 percent in 1987. Motorola's introduction of the world's smallest portable cellular phone, the Micro-TAC, in 1989 was followed in 1990 by the introduction of similar portable models by other manufacturers. Although there is enormous fluctuation in brand penetration and prices across the United States, five leading cellular brands are carried by more than 50 percent of all cellular dealers. The predominance of distribution channels by a few major suppliers limits the penetration of new manufacturers. Telephone sales are believed to exceed subscriber growth by as much as 30 percent because of purchases of additional and replacement phones.

Prices are predicted to increase somewhat with the introduction of dual-mode (i.e. both analog and digital capability) mobile units by all major manufacturers between the second quarter of 1991 and the first quarter of 1992. Vendors have no plans to market dual-mode portables. By the end of 1992, digital-only mobiles and portables may be available. Because these units utilize inexpensive digital signal processing chips rather than duplexers and other components, prices are expected to be lower than those of analog and dual-mode.

Technical Developments

The first commercial application of intersystem handoff between the switching systems from different manufacturers took place in mid-1990, using the industry-developed cellular system networking standard, Interim Standard or IS-41. This important development brought the industry one step closer to achieving a "seamless" nationwide cellular network, in which calls can be continued across individual system boundaries without interruption, rather than being disconnected.

Although some intellectual property rights issues are still to be resolved, a subcommittee of the Telecommunications Industry Association completed work on the dual-mode cellular air-interface technical standard, known as IS-54 in June 1990, after two years of intense work by the industry. This standard is considered the crucial first step in the drive to digital cellular because it ensures that equipment made by different manufacturers will be compatible. IS-54 establishes digital compatibility and guarantees that cellular operators can introduce digital equipment without affecting the ability of established customers to continue using their analog phones.

In August 1990, the cellular industry initiated a voluntary program to validate new equipment being developed for the conversion to Time Division Multiple Access (TDMA) digital cellular transmission. The purpose of the program is to facilitate the timely introduction of digital cellular technology and to ensure that dual-mode mobiles will work compatibly with the dual-mode systems of various manufacturers. March 31, 1991, is the target for a "commercial lockdown," which will occur when a minimum of three systems and four mobile units successfully complete a series of laboratory tests and field trials. The objective of this optional validation program is to enable manufacturers of subscriber equipment to gain adequate assurance of network compatibility before beginning commercial production.

Regulatory Developments

By mid-1990, about 75 percent of all markets in Rural Service Areas (RSAs) had been issued construction permits by the FCC, although less than 25 percent had been licensed. RSA markets are important for truly nationwide cellular service because they include many heavily travelled corridor areas between cities. In addition, licenses for the Metropolitan Statistical Areas (MSAs), which were issued for a period of 10 years, will be up for renewal beginning in 1993. The FCC has proposed criteria for license renewal, allowing carriers a presumption of renewal expectancy absent "any substantial relevant misconduct."

Several current cellular operators have petitioned the FCC for permission to conduct PCN trials on cellular spectrum as well as higher frequencies. As long as basic cellular service is not impaired, FCC policy allows licensed cellular operators to experiment freely with novel modulation techniques and services within their spectrum allocation, thereby alleviating the need for a new license application. With the shortage of RF capacity in major urban areas, however, cellular companies will be reluctant to permanently devote much of their profitable and limited spectrum to new services unless spread-spectrum technology proves that the two services can coexist.

At the state level, the cellular industry encountered mixed results in 1990. Although demands for rigid regulation of the cellular industry were rejected, a troubling precedent was set by a ruling that cellular companies must pay full access charges if they wish to offer Wide Area Calling service to their customers. In addition, the courts dismissed claims that cellular operators must scramble their signals in order to provide privacy, ruling that the potential for eavesdropping of cellular transmissions is not equivalent to the intentional divulgence of information.

International Trade and Markets

Imports continue to play an important role in the U.S. cellular market, increasing about 9 percent from $253 million in 1989 to an estimated $275 million in 1990. Hong Kong, Korea, and Japan were the dominant suppliers, with 52, 23, and 18 percent of imports, respectively. Imports were up 52 percent from Hong Kong, flat from Japan, and down 6 percent from Korea.

The total world market for cellular radiotelephone service reached about 9 million subscribers in mid-1990. The United States remains the largest single country market, with nearly 50 percent of total subscribers. Leading markets after the United States are in the United Kingdom, Japan, Canada, Germany, and Scandinavia. Subscriber growth in Japan has been particularly strong with the implementation of new, higher capacity systems throughout the country.

Cellular radiotelephony worldwide continues to experience considerable growth, with at least six additional countries introducing cellular service in 1990. There were more than 10 million subscribers in more than 70 countries at the end of 1990, with more than 3 million in Europe alone. Europe continues to move toward implementation of the Pan-European digital cellular network, scheduled to begin limited service in mid-1991. Between 10 million and 20 million subscribers to Europe's digital cellular system are predicted by the end of the decade, resulting in market penetration of about 3 percent. By the end of 1991, cellular service will be available in more than 80 countries serving more than 13 million subscribers. Growth markets in 1991 include newly industrialized countries such as Brazil, Mexico, and the Pacific Rim nations. An increasing number of countries, including Greece, Venezuela, and Portugal, are moving toward the privatization of cellular telephony. The utilization of several incompatible technologies continues to limit international roaming (service outside of one's local service area) to contiguous geographic areas and/or countries that employ the same system type. This problem should be alleviated somewhat with the implementation of digital cellular systems, but is unlikely to be resolved in this generation of technology.

The U.S. cellular industry has become increasingly active in the world market, winning additional system contracts and operating licenses in 1990. On the equipment side, Motorola's speech codec (coder-decoder) was selected as the standard for Japan's digital cellular network. In addition, Motorola and AT&T were selected by NTT to participate in prototype development for this system. Consortiums including Regional Bell Operating Companies, Contel, Millicom and others were selected to operate cellular systems in countries such as Mexico, Germany, Czechoslovakia, and Hungary.

Future Market Growth

Driven by the opportunities provided by digital technology, the U.S. cellular market is expected to experience steady growth in 1991. The rate of growth in equipment sales should drop slightly to about 25 to 30 percent, reaching $3 billion to $3.5 billion. Capital investment will likely reach $7.5 billion by the end of 1991. With the number of U.S. subscribers predicted to approach 7 million (up 35 percent over 1990), service revenues are expected to increase nearly 30 percent to an estimated $6.6 billion. Subscriber growth is likely to continue at current rates for the foreseeable future.

The key to cellular's growth will be the conversion to digital cellular, driven by analog cell site congestion and intense demand. Although this congestion is not a pervasive problem throughout the U.S. or even within particular metropolitan areas, it has had a direct negative effect on the overall cost of cellular infrastructure equipment, and thereby service charges and future sales. In addition, real estate prices and local zoning regulations make it increasingly difficult and costly to further expand analog cellular networks.

Digital cellular using TDMA transmission will increase capacity to three times that of analog cellular initially, rising to six and possibly 10 or 12 times higher in the longer term, using existing cell sites. In addition to the capacity benefits, other advantages for both operators and users include: (1) enhanced functionality—security/encryption, high speed data and simultaneous voice/data transmission, messaging, vehicular tracking; and (2) improved system performance—quieter handoffs, better sound quality, fewer "dropped" calls. In addition, digital cellular offers significant cost savings for network operators.

With analog cellular's limited capacity, considerable capital investment per subscriber has been required. Even though the cost of digital base station equipment will be greater than the analog equivalent, the capacity augmentation associated with digital cellular will result in declines in the average cost-per-channel of 40 to 50 percent. As a result, the profitability of service providers should increase. Nonetheless, analog and digital cellular systems will coexist in parallel for some time. The demand for new services as well as price evolution will dictate a gradual shift toward an all-digital network.

A certain amount of discord over digital cellular standards remained evident within the industry, with some manufacturers and operators announcing their intention to develop CDMA systems rather than, or in addition to, the agreed-upon TDMA standard. Such a major change made at this point could result in both higher development costs and delays in the conversion to digital.

The majority of cellular subscribers are business and professional customers who depend on cellular as a productivity tool. Cellular service providers will need to attract a larger segment of the ordinary consumer market in the next few years. In addition, with layoffs occurring in many end-user industries, cellular must reach out to smaller and new companies. Cuts in monthly charges and creative advertising campaigns, which are already becoming evident, should attract new customers.

In sum, the leading factors affecting market growth in 1991 will be: (1) the speed with which rural systems are constructed; (2) further facilitation of nationwide roaming through implementation of intersystem handoff; (3) the commercial availability of dual-mode equipment; and (4) the ability of system operators to reduce service costs sufficiently to penetrate the consumer market.

In the longer term, recent forecasts project a market of 15 million to 20 million subscribers in the United States by 1995. The continued expansion of the cellular industry will depend upon: (1) implementation of a new and uniform digital cellular technology to handle current and expected demand; (2) further improvements in battery and circuit technology to reduce the size, weight, and cost of cellular portable radiotelephones; (3) the reduction of service prices to acceptable consumer levels and (4) allocation of radio spectrum for complementary and competitive services.

U.S. and European initiatives to implement digital cellular networks will create sizable markets for equipment suppliers in the early to mid-1990s. As in the case of analog technology, the size and importance of the U.S. market will be significant in lowering the cost of digital cellular equipment and creating export opportunities for U.S. cellular suppliers. In addition, strong interest within the cellular industry in offering new wireless services should stimulate cellular demand. These new services are unlikely to compete directly with cellular because of the prohibitive cost of constructing separate infrastructures on a nationwide basis, as well as technical limitations.—*Linda L. Gossack, Office of Telecommunications, (202) 377-4466, October 1990.*

MICROWAVE SYSTEMS

The market for microwave communications equipment encompasses: telephone common carriers; private systems (such as pipeline, railroad, and oil industries, local area networks, mobile telephone, and telephone company bypass applications); broadcast radio and television; cable television; and Federal, state, and local governments. Common carriers represent around 60 percent of the installed microwave market; private systems, 15 percent; and other users, 25 percent. U.S. shipments of complete microwave systems increased about 2 percent to approximately $870 million in 1990 from $855 million in 1989, primarily the result of equipment sales for short-haul operations.

U.S. Industry Trends

The microwave communications industry is undergoing fundamental changes as a result of improvements in technology and competition from fiber optic and satellite systems. The trend in microwave systems is toward short-haul, urban systems operating in higher transmission frequencies. Inherent advantages over the competing technologies of satellite communications and fiber optic cable ensure several market niches for this industry. Microwave systems can be installed quickly and cheaply, in part because no right-of-way is required, they also can serve rugged or inaccessible areas readily. As a result, today's best prospects for microwave are in high-frequency, short-haul, urban markets, and thin-route rural markets. Private microwave networks will continue to be attractive, cost-efficient systems. Microwave systems are also emerging as reliable disaster recovery telecommunications systems and are increasingly being used to expand one-time or temporary capacity for existing telephone systems, or to link cell sites for cellular telephone systems.

Traditionally, microwave signals were transmitted over long-haul paths reaching up to 40 miles without repeaters. The largest owners and service providers using these systems were regional wireline telephone companies and the long-distance service providers such as AT&T, U.S. Sprint, and MCI. These long-haul, thick-route, TD-2 analog microwave systems, installed coast-to-coast in the 1940s and 1950s, are now rapidly being replaced by fiber optic systems, eroding the dominant role of microwave technology in this market. In its place, short-haul transmission paths—5 to 10 miles without repeaters, operating in the 18 GHz or 23 GHz range—have grown in the past few years. In particular, short-haul microwave has become prevalent in urban areas, used as an alternative to leased lines in bridging the distance either between the long-distance carrier and the office or between facilities.

The refinement of high-frequency microwave has facilitated short-haul microwave transmission, and contributed to even more competitive prices and higher trunk speeds. While microwave transmission is traditionally understood to mean frequencies above 1 GHz, overcrowding of the most popular frequencies—2.4 GHz and 6 GHz—by common carriers has increased interest in frequencies above 11 GHz, as high as 38 to 60 GHz. Such high frequencies, particularly when coupled with digital technology, can increase trunk speed dramatically. Higher frequency ranges also have the advantage of increased access to spectrum in the 18 to 23 GHz range, and less stringent FCC technical requirements, easing development costs for higher frequency systems. In addition, higher frequencies translate into shorter wavelengths, and therefore smaller, cheaper antennas. These shorter transmission paths also facilitate the use of low-power, solid-state microwave devices.

Nearly all new microwave systems being installed today are digital, replacing older analog systems. These new systems take advantage of efficient digital switches and can more readily transmit digital signals. New analog equipment sales are being made largely to maintain existing rural analog telephone systems, to broadcast and cable television (CATV) systems, and to overseas markets. Also, due to frequency overcrowding in the lower gigahertz range, many of the new urban systems are utilizing the higher frequency ranges of 10 to 23 GHz.

Ten U.S., Japanese, and Canadian firms, comprising about 96 percent of the market, continue to dominate the microwave communications equipment industry. A number of other firms specialize in civilian and military government contracts. By the mid-1990s, however, market competition will likely whittle the number of microwave manufacturers to only five or six large suppliers.

In 1990, total sales were split as follows: approximately $151 million was for private microwave systems, up from $141 million in 1989; $23 million for CATV systems, up from $22 million in 1989; around $215 million for state, local, and Federal Government agencies (including the military); with the remaining $460 million for common carriers and the broadcasting industry. Growth will remain slow at around 2 to 3 percent yearly for the next three years. Industry sources expect short-haul operations to increase 22 percent per year until 1992, while long-haul decreases around 3 percent yearly over the same period.

The FCC estimated that about 1,500 U.S. common carriers operated some 17,000 individual microwave stations (i.e., towers) in 1990. Over the past three years, the flow of FCC applications for new station permits has remained constant at around 8,000 applications yearly, and FCC officials do not expect this rate to increase substantially over the next few years. The FCC reports 32,871 individual private microwave stations licensed in 1990, with notable growth in the 23 GHz range and in point-to-multipoint applications. In addition, the FCC licensed around 2,287 Cable Antenna Relay Services (CARS) systems in 1990—microwave transmission used to bridge gaps between cable systems. The FCC expects continued growth in CARS systems licensed, with a constant 10-percent rate of increase yearly over the next few years.

Sales growth will slow in several major segments of the market over the next three years. With nearly 90 percent of the roughly 1,450 public and private broadcast television stations using microwave equipment, this market appears fairly saturated. Most sales of microwave equipment will be for replacement of existing towers, not new stations. The same can be said for the approximately 10,000 AM and FM public and private radio broadcast stations. Sales to long-haul, rural common carriers will support maintenance functions, with most new sales for short-haul, digital stations. Federal budget constraints will cause domestic sales to government agencies, especially the Defense Department, to remain stagnant through 1991.

Foreign Trade

Although the export market for microwave communications equipment remains substantial, official trade data are limited. Exports of radio transmitters for frequencies over 1,000 MHz were estimated at approximately $20.2 million for 1990. Foreign sales of radio receivers for frequencies over 1,000 MHz declined slightly from $17 million in 1989 to an estimated $16.5 million in 1990. Export data for microwave antennas, amplifiers, exciters, converters, waveguides, and other equipment are not available. While the precise amount is not known, exports to the Third World often consist of second-hand, analog microwave equipment. The largest export market for microwave communications equipment appears to be in developing and oil-producing countries, where lack of infrastructure and rough terrain make microwave systems more competitive.

During 1990, approximately $7.6 million worth of radio transmitters and just under $1 million worth of radio receivers for frequencies over 1,000 MHz were imported into the U.S. Import data for other microwave equipment were not available.

Future Growth

Competition from fiber optic and satellite systems and the saturation of traditional markets will hold growth in the total market for microwave systems at about 2 to 3 percent per year for the next three years. The U.S. market for microwave systems will be approximately $885 million in 1991, $910 million in 1992, and $935 million in 1993. Generally, short-haul microwave systems will overtake long-haul systems, and digital equipment sales will grow at the expense of analog equipment sales. Domestic digital microwave equipment sales are projected to rise from $430 million in 1990 to $590 million in 1993. Domestic sales of analog microwave equipment will drop from $345 million in 1990 to $265 million in 1993. Revenues from equipment sold for long-haul microwave applications will slip 3 percent a year from $405 million in 1988 to $360 million in 1993. Domestic sales designated for short-haul systems will rise from an estimated $170 million in 1990 to $375 million in 1993.

International markets will show sustained interest in microwave technology, led by Germany and the United Kingdom. Eastern Europe's urgent need for quick and relatively inexpensive improvements in telecommunications systems dovetails with the strong aspects of microwave technology. However, the shortage of foreign currency in the region and the potential competition from fiber and satellite alternatives will limit sales to the Eastern European market.

In the future, microwave equipment will increasingly be integrated with other technologies such as cable, fiber optics, and local area networks. Microwave technology will figure prominently in the emerging markets of telecommunications for disaster recovery and in high-speed data transmission. The next five years will see further expansion of digital applications, aided by improved compression techniques, and reduced equipment interference through the use of new superconduction breakthroughs. The industry will continue to focus on exploiting higher frequency ranges (30 to 1000 GHz), in order to fully utilize the microwave capabilities in the electromagnetic spectrum.—*Patricia A. Cooper, Office of Telecommunications, (202) 377-4466, October 1990.*

FIBER OPTICS

The U.S. fiber optics market continued its steady growth in 1990, rising to about $1.4 billion. The increasing use of fiber optics in the local loop, Metropolitan Area Networks (MANs), Local Area Networks (LANs), and cable television (CATV) systems contributed to the market's growth. In the long term, current fiber-to-the-home (FTTH) and fiber-to-the-curb (FTTC) trials have shown that fiber optics is a viable and economic transmission medium for voice, data, and video. However, various state and local regulatory problems must be resolved in the near future if the U.S. fiber optics market is to have dramatic growth in this decade and beyond.

U.S. Market Trends

The U.S. market for cabled optical fiber in 1990 rose to about 2.0 million fiber-kilometers. Prices for fiber optic components continued to decline across the board as production volumes rose and consumers gained more experience with this technology and its applications.

The value of shipments of optical fiber for data and nondata transmission (SIC 32318) rose slightly in 1990, to $325 million from $312 million in 1989. Shipments of fiber optic cable (SIC 33579) were valued at about $650 million in 1990, compared with $624 million in 1989. Shipments of fiber optic systems and equipment (SIC 36631 13) increased in 1990 to approximately $500 million, up/down from the 1989 figure of $46 million. Fiber optic test equipment, including optical time domain reflectometers (OTDR) (SIC 38252 85), stood at an estimated $13 million in 1990, or about the same as in 1989.

With the virtual completion of digital interexchange networks, the local loop has assumed a more prominent role in the use of fiber optic equipment. On the aggregate, deployment of fiber optic equipment by the local subsidiaries of the Regional Bell Operating Companies (RBOCs), GTE, and Contel has more than doubled since 1987, amounting to over 4 million fiber-kilometers installed. At the same time, alternative access carriers, also known as "bypass carriers," are installing MANs in major business centers in major cities across the United States. According to the Federal Communications Commission (FCC), these carriers had deployed close to 55,000 fiber-kilometers by year-end 1989. One market research firm has forecast that 29 MANs could be operating in 18 cities by the end of 1991.

Both long-distance and local telecommunications providers are experimenting with Synchronous Optical Network (SONET) transmission products that start with speeds of OC-1 (51.84 million bits per second) to OC-48 (2.4 billion bits per second). SONET is an international standard based on fiber optics that allows individual channels or bytes to be accessed within a bit stream. This will provide for the transport of broadband services on single-mode optical fiber. Although aspects (or "layers") of the SONET standard have not been completed, several companies introduced SONET products in 1990.

Several additional FTTH and FTTC trials were announced in 1990, driving fiber optics closer to the subscriber. The trials numbered more than 40 at year-end 1990 and generally provided voice, data, and CATV to the home. Contel, GTE, and the RBOCs are evaluating both FTTH and FTTC systems, although the latter seems to be gaining in popularity based on its less expensive cost and ability to upgrade to direct installation to the home at a later time. Passive optical networks (PON), which split optical signals to serve several homes, also are being evaluated.

Over the last two years, multiple service operators (MSOs) of CATV systems have dramatically increased their use of fiber optics. Each of the 20 largest CATV operators in the United States have employed fiber optics to upgrade their networks, reduce operating costs (by reducing the number of amplifiers needed), lower maintenance, improve reliability, and enhance signal quality. The National Cable Television Association (NCTA) estimated in 1990 that cable industry deployment had jumped 600 percent since 1988 and will increase at an annual rate of 25 percent through this decade. Similarly, electrical utilities have increased their deployment of fiber optics for their communications networks.

The installation of fiber optics grew in 1990 for businesses and other organizations with large data communications needs. The fiber optics' share of the Local Area Network (LAN) market has been rising but is still primarily confined to serving as the "backbone" of these systems and various niche markets. Nevertheless, the virtual completion of technical standards for the Fiber Distributed Data Interface (FDDI), a 100/125 megabit-per-second dual token-ring LAN, in 1990 will serve as the primary driver for the fiber optic LAN market into the mid-1990s. The decline in costs for various FDDI components should also accelerate the use of fiber optics in high-speed LANs.

Other small but growing markets for fiber optics include the military, sensor and medical markets. The Department of Defense listed fiber optics as a "critical technology" and indicated that it could provide higher information-carrying capacity for ships, aircraft, and undersea communications by factors of 10 to 100. The military is also a substantial consumer of fiber optic sensors and fiber optic LANs.

Submarine Systems

Numerous submarine fiber optic cable systems were completed or announced in 1990. PTAT-1, the trans-Atlantic submarine cable linking the United States with the United Kingdom, began service in the fall of 1990. The North Pacific Cable (NPC) between the United States and Japan was scheduled to begin commercial operations in December 1990. The Hong Kong-Japan-Korea (H-J-K) cable was also scheduled to start service in 1990. Other major submarine projects either planned or under construction were TAT-9 (United States-Spain, United Kingdom, Spain, France, service in 1991); TPC-4 (United States and Canada-Japan, 1992); PTAT-2 (United States-United Kingdom, 1992); PacRim East (New Zealand-Hawaii, 1993); ASPAC (Japan-Hong Kong-China-Singapore, 1993); TAT-X (United States-United Kingdom, 1993); PacRim West (Australia-China, 1996); and TPC-5 (United States-Japan, 1996). All told, investment in current and future transoceanic fiber optic systems may top $11 billion by the mid-1990s.

INTERNATIONAL COMPETITIVENESS

The United States continues to enjoy a surplus in the international trade of optical fiber and fiber optic cable. Imports of optical fiber and fiber optic cable rose to about $40 million in 1990, a $9-million increase from $31 million in 1989. Exports rose about 15 percent in 1990, to $160 million from $143 million in 1989. The trade surplus rose slightly from $111 million to $121 million. However, it should be noted that many foreign-based companies produce cable, fiber, and other fiber optic components in facilities located in the United States. (Trade figures only report these two products and do not include optoelectronic products, connectors, splicing equipment and other fiber optic components.)

The U.S. share of the world market is likely to decline in the next three to five years as both developed and developing countries install fiber optics on a massive scale. Nippon Telegraph and Telephone (NTT), the dominant telecommunications provider in Japan, announced its "vision" to install single-mode fiber to every home by 2015. Installation is expected to begin in 1995. According to one report, Japanese demand for optical fiber may exceed 10 million fiber-kilometers by the year 2000. As in the United States, the United Kingdom is experimenting with the deployment of fiber optics in the local loop. British Telecom began a trial to 400 business and residential subscribers in the town of Milton Keynes that featured both active and passive optical devices. After successful FTTH trials in Biarritz and Paris, France has embarked on a two-phase installation of a fiber optic long-distance network covering the entire country. The project would cost more than $600 billion and total 17,000 cable-kilometers by the mid-1990s. Italy's Project 80 Enhanced Plan will link its western and offshore cities with an extensive fiber optics network. Several Central European countries are looking into a fiber optics network. A network linking several countries of the Conference of European Postal and Telecommunications Administrations (CEPT) has also been discussed. On the same scale, a group of railway companies is looking to install a pan-European broadband fiber optics network called "Project Hermes."

The United States, Japan, the United Kingdom, Germany, and France have been among the countries active in the research and development of fiber optics. Companies in these countries, often with government assistance, are experimenting with optical amplifiers, optoelectronic integrated circuits, multiplexing, high-speed transmission networks, coherent transmission, and optical switching systems. Early in 1990, AT&T announced that it had successfully demonstrated an optical processor that could form the basis for the development of optical switches and optical computers.

While many of these areas are several years away from the commercial market, they are nonetheless indicators that the capacity of fiber optic systems has only just been tapped. Coherent transmission systems, for example, could result in repeaterless submarine cables across oceans.

The U.S. fiber optics market should continue to enjoy steady growth in the early to mid-1990s. Continued progress in standards such as FDDI and SONET will ensure reliability and interoperability for transmission products and should help make fiber optics more prevalent in the local loop. Costs for both SONET- and FDDI-compatible products are expected to decline throughout the 1990s.

The next major boon for the U.S. fiber optics market will be in the local loop, most notably as fiber gets closer to the home. Before fiber-to-the-home becomes a reality, however, a number of issues—technical, economic/commercial, and regulatory—must be addressed and resolved. In the technical area, questions include: How will the network be powered and who will pay? What architecture will be used? Will it be passive or active? In terms of economics and the commercial marketplace, when will fiber become cost-competitive with other transmission media in the local loop? Do subscribers want or need the number or variety of services fiber optic broadband facilities can provide? In terms of regulatory matters, who will be allowed to provide broadband services to the home—telephone companies, cable TV providers, utilities, or a combination of the above? The answers to these questions may ultimately decide the competitive future of the U.S. fiber optics industry. Assuming the answers to these questions can be provided in the next few years, the industry will enjoy dramatic growth and a stronger competitive posture into the late 1990s and the 21st century.—*James M. McCarthy, Office of Telecommunications, (202) 377-4466, October 1990.*

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Entertainment

The motion picture industry is expected to show about a 1.3 percent growth in box office receipts in 1991. Led by gains in compact disk sales, revenues of the prerecorded music industry are forecast to rise 4 percent. Growth of the home video industry is expected to be considerably off the pace of 1988 and earlier years, with combined videocassette sales and rentals increasing about 4 percent. Revenues for the cable television industry should grow 15 percent in 1991.

Technological advances continue to drive growth in the entertainment industry, as new electronics products make various forms of entertainment more accessible to the public. Satellite communications systems have dramatically increased the industry's ability to reach markets throughout the world. Europe, for instance, is opening its television systems to greater programming diversity, with satellites and cable making it possible to reach the entire European market simultaneously.

Several problems could slow the very growth these new technologies have fostered, however. Foremost among them are piracy—the unauthorized copying and sale of recorded material—and a trend in Europe and elsewhere toward exhibition quotas that restrict the showing of foreign programs. Home video and cable television have contributed substantial ancillary revenues to the motion picture industry, but the technologies that make these revenues possible have also aggravated the problem of film piracy. Piracy is also a problem for the home video and cable television industries—which have had to encode tapes and satellite signals to protect their program rights—as well as for the recorded music industry. For background, see 1990 U.S. Industrial Outlook, chapter 47 (Entertainment).

MOTION PICTURES

The motion picture industry includes firms that produce and distribute feature films, television programs, and home video material.

U.S. films are shown in more than 100 countries, and American television films and programs are broadcast in more than 90 international markets. In addition, the film industry provides the vast majority of prerecorded video programs for the world's home video market, and is a primary supplier of filmed entertainment for other home delivery technologies, such as cable TV and direct broadcast satellites. Summer 1990 marked the beginning of a slowdown in box office receipts, which may signal the end of an unprecedented five-year boom. In 1989, box office receipts rose to an all-time record of $5.03 billion, up 13 percent from 4.46 billion in 1988. Box office receipts for the first 6 months of 1990 were about $2.72 billion, up about 23 percent from $2.21 billion during the first 6 months of 1989. But by the end of August, receipts had fallen about 1.5 percent, a trend that appeared likely to continue. If so, receipts for the full year were expected to reach about $5 billion. Many of the big-budget films released for the summer 1990 market appear likely to earn slender profits.

Theaters, Admissions, Ticket Prices

An estimated 23,130 theater screens were operating in the United States in 1989, about 22,039 of them indoors and the remainder at drive-ins. This was 0.4 percent fewer than in 1988, the second year the number of screens declined since 1982. Multiplex theaters are becoming more widespread because they make it possible for owners to spread the risk of an unsuccessful film over their investments in several screens. The industry trend toward consolidation and vertical integration continued in 1989, but at a slower pace than in previous years.

According to the Motion Picture Association of America (MPAA), theater attendance totaled 1.13 billion in 1989, an increase of about 4.1 percent from 1988. In 1989, admissions surpassed 1 billion for the 13th consecutive year. A small gain to 1.2 billion admissions was estimated for 1990.

Continuing a pattern of the preceding decade, movie ticket prices increased in 1989. The average ticket cost $4.45

Trends and Forecasts: Motion Picture Theaters (SIC 783)

(in millions of dollars except as noted)

Item	1987	1988	1989	1990[1]	1991[2]	Percent Change Compound Annual 1972–86	 1981–86	 Annual 1988–89	 1989–90	 1990–91
Box office receipts	4,250	4,460	5,033	5,033	5,100	6.9	5.0	12.8	0.0	1.3
Theater employment (000)	106.0	107.6	—	—	—	−1.3	−2.8	—	—	—

[1] Estimate by International Trade Administration.
[2] Forecast.

SOURCE: U.S. Department of Commerce: International Trade Administration and Bureau of the Census; U.S. Department of Labor, Bureau of Labor Statistics; Motion Picture Association of America, Inc.

in 1989, an 8.1 percent increase over 1988. It was higher ticket prices rather than the number of admissions that accounted for most of the 1989 increase in box office recipts.

Film Production

Feature entertainment motion picture starts by major Hollywood producers and independents, which fell in 1988, declined 32 percent in 1989. This was in marked contrast to the high rates of film production between 1983 and 1987. A small number of successful films continue to account for a large percentage of U.S. box office receipts. According to industry sources, the majors and independents combined started a worldwide total of 345 motion pictures in 1989, a significant drop from 511 in 1988. Starts by major Hollywood producers, 134 in 1988, declined 16 percent in 1989, to 112. In 1988 the independent studios started 377 productions, but in 1989 the number of starts declined 38 percent, to 233.

Overseas starts of films by U.S. producers also declined in 1989, falling 42 percent to 106. Of these, the majors accounted for 23 films, down 48 percent from 1988. The independents started 83 films overseas, a decline of 48 percent from 1988.

Worldwide there were 220 motion picture starts through the first 7 months of 1989, a 22 percent decline from the same period in 1988. Major producers started 74 films in the first 7 months of 1989, a decline of 15 percent from 1988, and independent producers started 146, a decline of 26 percent.

Industry observers believe that the number of films produced will continue to decline during the period 1990–94. One reason is that the industry can no longer afford the large number of starts of recent years. Another reason is that smaller and unproven companies are finding it more difficult to obtain financing.

INTERNATIONAL COMPETITIVENESS

The American motion picture is among this country's most successful exports, contributing $4 billion or more a year to the balance of payments. The industry relies heavily on foreign markets as a source of income. In the case of the major film companies, about one-third of total revenue comes from abroad.

Because 8 out of 10 films fail to recover their investment costs from exhibition in U.S. theaters, producers look to foreign markets—along with domestic cable, videocassette, and television sales—to provide the ancillary income vital to make a profit. Even with foreign and other ancillary income, however, 6 out of 10 films never recover their investment costs.

According to *Variety*, the major U.S. distributors' worldwide rental revenue for feature films climbed 29 percent in 1989, from $2.43 billion in 1988 to a record $3.13 billion. Domestic rentals accounted for $1.78 billion of the total, and export markets another $1.35 billion. The leading export market for the fifth straight year was Japan, with $201.6 million in film rentals, an amazing 42 percent increase over 1988. Canada continued in second place, with $152.5 million in rentals, a 22 percent increase over 1988. France was third with $127.6 million, up 29 percent. West Germany, formerly in second place, slipped in 1989 to fourth place with $117.5 million, a rise of 17 percent. The United Kingdom and Ireland, taken as a single market, and Spain completed the top 6 foreign markets. The top countries together accounted for about 53 percent of a export rentals; the top 15 countries accounted for about 8 percent.

An industry survey of independent U.S. distributor found that foreign sales of motion pictures for theatrical television, and home video display during the fiscal yea ended June 30, 1989, were about $1.1 billion, a 19 percen increase over the preceding year. Detailed comparisons with earlier years are difficult, however, because the independents used new survey methods and reporting periods for previous fiscal years. Sales in Europe account for about 65 percent of the total. Far East sales account for 21 percent. The United Kingdom was the leading European market for the independents, which sold $168.7 million worth there. Japan, the leading market for the major studios, also accounted for $158.6 million of the independents' sales, and France $94.2 million.

Although motion pictures remain one of the strongest U.S. exports, industry leaders contend that they encounter a wide variety of trade barriers in foreign markets. These include import and screen-time quotas, foreign subsidies for indigenous production and distribution, high taxes on box office receipts, restrictions on foreign remittances, and ineffective copyright protection. The trade barriers and the reasons for erecting them vary from country to country. Some foreign governments want a greater share of the profits. Others seek to protect or subsidize local film industries, or to defend their native languages and culture against a perceived threat of foreign cultures.

A European Community (EC) directive adopted in October 1989 to facilitate cross-border broadcasting also imposes a minimum quota of "European works" on television in the EC. The U.S. Government and the industry, concerned that the directive will hamper the ability of American companies to sell filmed entertainment in Europe, oppose the quota. The United States has consulted with the EC under the General Agreement on Tariffs and Trade (GATT) to learn more about the EC's plans and to emphasize continuing U.S. opposition to the quota.

Piracy is another serious problem for the motion picture industry. New technologies, especially videorecorders and cable and satellite television, have facilitated the unauthorized duplication of videocassettes and interception of signals. The major studios estimate that piracy costs them about $1.2 billion a year in lost revenue.

The motion picture industry has mounted a strong worldwide anti-piracy campaign and is working with the U.S. Government to obtain better copyright protection abroad. Both Congress and the executive branch have actively addressed this problem. The Omnibus Trade and Competitiveness Act of 1988, which contains special provisions to assist U.S. industries that rely on copyright in dealing with foreign market barriers, has already helped improve intellectual property protection abroad. The U.S. Department of Commerce has established a program to identify the most seriously offending countries and, through bilateral negotiations and other activities, to improve protection of copyrights and other intellectual property rights. These government-wide efforts have shown results. The International Intellectual Property Alliance (IIPA) reported that losses to piracy in 10 selected countries declined about 50 percent between 1984 and 1988. Singapore, Malaysia, and South Korea, once centers of pirate trade in motion pictures, have substantially improved copyright protection for U.S. films. Additionally, a crackdown on Japanese home video piracy cut the annual worldwide piracy loss by $250 million dollars in 1989. The United States also is negotiating an agreement on trade-related intellectual property measures under the current round of multilateral trade negotiations under GATT. Finally, the international film registry being developed by the World Intellectual Property Organization (WIPO) will help combat piracy by keeping track of assignments of film rights.

Outlook for 1991

The longest run in history of steadily rising box office receipts ended in 1990. In 1991, box office receipts appear likely to rise a small amount over the record $5.03 billion set in 1989. The full-year total should be about $5.1 billion.

Long-Term Prospects

Motion picture theaters are competing successfully with the home video format and should remain an important source of entertainment revenue throughout the world. Box office receipts should revive after about 18 months. With production starts continuing at adequate levels and ticket prices edging up, box office receipts are expected to recover from the current downturn and begin growing at an average of 1.5 percent through 1994.—*John E. Siegmund, Office of Service Industries, (202) 377-4781, October 1990.*

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Motion Picture Association of America, Inc., 1133 Avenue of the Americas, New York, NY 10036. Telephone: (212) 846-6161.

Boxoffice, RLD Communications, Inc., 1800 N. Highland Avenue, Hollywood, CA 90028. Telephone: (213) 465-1186.

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MUSIC

Prerecorded Music

The industry reported that the dollar value of manufacturers' shipments of prerecorded music was $6.46 billion in 1989, up 3.35 percent from 1988. The value of shipments was estimated to be $6.73 billion in 1990—an increase of about 4 percent. Since the suggested retail price is the basis for reporting, the actual dollar value may be lower because of discounting. Unit sales in 1989 were 800.7 million, surpassing the previous high of 761.9 million in 1988. Unit sales in 1990 were estimated at 853 million, an increase of almost 7 percent.

Prerecorded cassettes, the preferred format since 1983, accounted for 53.7 percent of all spending on recorded music in 1989, a percentage that has remained roughly constant since 1984. Cassette sales in 1989 declined by 1.16 percent to $3.35 billion. Unit shipments also declined by 0.95 percent to 446.2 million. Unit sales in 1990, down for the second year, were estimated at 437 million, a 2 percent drop. Total value was $3.28 billion.

Sales of compact disks (CDs) have continued to grow rapidly since their introduction in 1983. The dollar volume of sales surpassed long-playing (LP) albums for the first time in 1987. In 1988, unit sales of CDs also surpassed those of LPs for the first time. Unit sales of CDs increased 47 percent in 1988, and 38.4 percent in 1989 to 207.2 million units. Value in these 2 years climbed 31 percent and 23.8 percent, respectively, reaching $2.58 billion in 1989. Sales continued to grow in 1990, by about 28 percent in number of units, to about 265 million, and 18 percent in value, to nearly $3.1 billion.

The number of CD players imported (imports about equal domestic consumption) continues to grow. In 1989, the United States imported 5.4 million CD players, an increase of 26 percent over 1988. An estimated 19 percent of the 91.4 million U.S. households have CD players, still below the roughly 30 percent penetration needed before the machines qualify as a mass consumer product. Nor have prices of CDs dropped as quickly as expected. These factors could slow the growth in sales of recorded music, since CDs have accounted for most of the recent growth.

Manufacturers' shipments of LP and extended-play (EP) albums continued to decline, falling by 52.2 percent in 1989 to 34.6 million units. Dollar volume for 1989 declined 58.6 percent to $220.3 million. Unit sales of disk singles, which generally contain only one selection, continued to decline in 1990, falling by about 60 percent to an estimated 14.6 million units, and by 45 percent in value to about $64 million. Sales of a recently introduced format, the cassette single, reached $194.6 million in 1989 on unit sales of 76.2 million. In 1990 sales of cassette singles continued to increase. Unit sales reached about 122 million, an increase of 60 percent over 1989. Sales reached $196 million, an increase of .7 percent. The other new format, the 3-inch CD, appears to be falling short of expectations, with 1989 sales declining 108.9 percent from 1988, the year of its

Trends and Forecasts: Prerecorded Music

(in millions)

Item	1987	1988	1989	1990[1]	1991[2]	Percent Change: Compound Annual 1973–86	Percent Change: Compound Annual 1981–86	Percent Change: Annual 1988–89	Percent Change: Annual 1989–90	Percent Change: Annual 1990–91
Manufacturers' unit shipments	706.8	761.9	800.7	852.7	899.6	0.1	−0.5	5.1	6.5	5.5
Manufacturers' dollar value[3]	5,567.5	6,254.8	6,464.1	6,728.7	7,065.0	7.3	3.3	3.3	4.1	5.0

[1] Estimate by U.S. Department of Commerce, International Trade Administration.

[2] Forecast.

[3] Shipments calculated at suggested list price.

SOURCE: Recording Industry Association of America.

introduction. In 1990 units sales and dollar values declined 1 percent.

Buyers under the age of 30 purchased 67 percent of the prerecorded music in 1988, according to demographic studies by the Recording Industry Association of America (RIAA). This percentage has risen slightly each year since 1985, when purchasers under the age of 30 bought 63 percent of prerecorded music. In 1985, purchasers under 25 purchased 52 percent, and by 1988 their share had risen to 53.9 percent. Purchasers under 30 have long been a critical part of the market for prerecorded music.

The music video continues to be important in the marketing of new albums and in exposing new performers to the public. By itself, however, it is not a significant revenue producer for recording companies, although this might change. In 1989, the RIAA reported sales of music videos for the first time. Shipments reached 5.96 million units worth $115.4 million, exceeding dollar volume from all formats except cassettes and CDs.

As of September 1990, the U.S. market for Digital Audio Tape (DAT) machines was clouded by uncertainty. In August 1989, the international recording and consumer electronics industries agreed on the Serial Copy Management System (SCMS), which would allow digital-to-digital recording on DAT machines, but limit the sequential copying of these copies. The music publishing industry remains strongly opposed to the SCMS system. Proposed U.S. legislation on DAT machines has not been acted upon. Recently, MITI, the Japanese Ministry of Trade and Industry, directed Japanese manufacturers of DAT machines to incorporate the SCMS system.

Music Royalties

Royalties collected for commercial use of writers' lyrics or composers' melodies provide another source of revenue in the music industry. In the United States, collection societies monitor the use of copyrighted music, collect royalties from users of music and lyrics composed or written by their members, and distribute the royalties to the members. Industry sources report that the American Society of Composers, Authors and Publishers (ASCAP), the largest of these societies, collected $317 million in royalties for its members in 1989, a 7 percent increase over 1988. In 1988 and 1989, remittances from foreign collection societies made up 18 to 19 percent of ASCAP's total collections, with $58 million and $56 million, respectively. Broadcast Music Inc., (BMI) the second largest performance rights group, does not release statistics on collections.

INTERNATIONAL COMPETITIVENESS

According to the International Federation of the Phonographic Industry (IFPI), 1988 sales worldwide of prerecorded music were about $20.3 billion, an increase of 21.4 percent over 1987. In 1988, for the first time, the dollar volume of sales in the EC surpassed sales in the United States, but unit sales in the United States remain the highest.

U.S. companies derive considerable revenues from foreign sales. According to industry estimates, the U.S. industry accounts for about one-half of total worldwide record sales, or about $10 billion. Since U.S. domestic sales in 1988 were about $6.3 billion, foreign sales are believed to be at least $3.5 billion. Export and import statistics are unable to account for all trade of the pre-recorded music, since a large portion of pre-recorded music sold abroad is manufactured abroad by subsidiaries of U.S. companies or under a license agreement. The Census Bureau, for example, reported 1989 U.S. exports of $1.08 billion and imports of $244.74 million. The positive trade balance of $839.31 million is widely perceived as reflecting only a portion of foreign revenues. An additional problem is that some of the imports are from U.S. companies' foreign manufacturing operations, rather than imports of foreign pre-recorded music.

Protecting Intellectual Property

Copyright infringement, including piracy and counterfeiting, remain the principal international trade problem for the music industry. Piracy is the copying and sale of recorded music without duplicating the packaging and without paying any compensation to, or receiving any authorization from, the copyright holder. Counterfeiting is copying recorded music for sale by unauthorized manufacturers in authentic-looking packaging. Because pirates pay no royalties or studio production expenses, they can sell their products at lower prices.

In April 1989, the International Intellectual Property Alliance (IIPA) reported significant progress in reducing the losses of U.S. copyright industries from piracy abroad. For the recorded music industry, the IIPA estimated that losses to the U.S. industry from piracy in 10 selected problem countries declined from $643 million in 1984 to $77 million in 1988. Losses from piracy in 11 problem countries, including some retained from the previous list and three new problem countries, totaled $192 million in 1988. In February 1990, the IIPA updated the report's country section, but left unchanged its loss estimates. Piracy is most widespread in Asia, Africa, and the Middle East.

Outlook for 1991

Sales of CDs in 1991 should progress at about the same rate as in 1990, in part the result of lower unit prices. Industry revenues are expected to increase 5 percent, with CDs continuing to be the format experiencing the most growth. Sales of cassettes should still exceed sales of compact disks, in quantity and probably in dollar value, though the gap in dollar value is closing. Digital audio tape (DAT) and other new media, such as recordable, erasable compact disks should continue to play a minor role in 1991.

Long-Term Prospects

Revenues of the prerecorded music industry are expected to grow at an average annual rate of about 4 percent through 1994. Technological developments promise to provide better quality and contribute to industry growth. The future of the DAT machine remains in doubt. Even if the disagreements about DAT are resolved, the medium may never become popular. One reason is that for many people cassette tapes provide adequate quality at a lower price. In addition, other formats may pass DAT by, such as a recordable, erasable compact disk. Some observers believe that consumers will be confused by a proliferation of formats, restraining sales of hardware and recordings. The influence of these new technologies on industry revenues remains difficult to predict.—*John E. Siegmund, Office of Service Industries, (202) 377-4781, October 1990.*

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HOME ENTERTAINMENT

After eight years of vigorous expansion, video rentals barely grew in 1989. Sales were sluggish in the face of lower sales of videocassette recorders (VCR), but it is anticipated that video rentals and purchases will remain a $10-billion business even without the double-digit growth rates of the 1980s. A return to this earlier momentum probably awaits a new-generation of video equipment and media.

Home Video

Home video has permanently altered the entertainment industry over the past decade. It is estimated that television network viewership fell by more than 19 percent between the 1981-82 and 1988-89 viewing seasons, in part because of the blossoming of video sales. Moreover, home video has had a major impact on U.S. motion picture companies: consumer spending on videocassettes exceeded domestic box office revenue by a factor of 2 to 1 in 1989. Film company revenue from video business has for years surpassed revenue from domestic theatrical exhibitions, and in 1989 U.S. film distributors earned an estimated $5.3 billion from home video sales, a 379 percent increase over 1984.

Any estimate of national growth rates for home video retail business is subject to important limitations, which account for the rather wide variation in industry analysts' assessments. For example, approximately two-thirds of the 29,000 video rental outlets are small stores. Such decentralization makes data collection imprecise. By all indications, however, total retail business leveled off in 1989. Rentals and purchases of videocassettes amounted to $10.1 billion in 1989, about the same as in 1988. While rental revenue amounted to approximately $6.7 billion, purchases rose to $3.4 billion, a 14.5 percent increase over 1988.

Industrial purchases of blank video cassettes rose by 11 percent in 1989, exceeding a half billion units for the first time. The year also saw a further decline in the popularity of the Beta videocassette format, with the ratio of VHS to Beta sales increasing from 84 to 16 in 1985 to 97 to 3 in 1989.

More than two-thirds of all U.S. television households now own at least one VCR. However, the already stabilizing number of VCRs sold to dealers decreased in 1989, falling by 5.8 percent to about 12.05 million units. More recently, the popularity of video cameras turned VCR sales around. In May 1990, for example, VCR sales to dealers posted a 25 percent increase over May 1989 on the heels of a 31 percent increase in video camera purchases.

Video growth has flattened for a number of reasons, including retail consolidation and the disappearance of many smaller specialty stores. By the end of the decade the number of new video stores openings declined significantly. VCR owners also tend to rent videocassetes less frequently after the first year of owning a player. Increasingly, too, first-time VCR purchasers tend to be people over 50, who are less likely to rent videocassettes.

Earlier fears among independents that U.S. film majors might gain control of video distribution to rental outlets and dominate the market have turned out to be unjustified. Wholesalers continue to play the dominant role in distribution to rental shops. However, as direct sales of videos expand, film studios and independent suppliers are playing an even-larger role in supplying non-video retailers such as drugstores and supermarkets. Wholesalers' primary customers are video retail stores, where profit margins are diminishing.

INTERNATIONAL COMPETITIVENESS

Although data on home video sales in foreign markets tend to be more incomplete than for the U.S. market, it is clear that international video activity remained vigorous in 1989. Europe continues to occupy center stage for video rentals and purchases with total revenue from the 18 largest countries amounting to between $3.5 billion and $4 billion. The Japanese market was equally robust, with 79 percent of television households owning at least one VCR and a video rental business of more than $2 billion annually.

The United Kingdom is the leading European market for video rentals, according to the London-based industry journal *Screen Digest*. Total consumer expenditures amounted to about $1.3 billion in 1989 and rental business is expanding at 5 to 10 percent per year. Growth was more modest in West Germany ($600 million to $700 million), Spain ($375 million to $425 million), France ($250 million to $300 million), and Italy ($220 million to $300 million). With the exception of the United Kingdom, where 65 percent of all television households own a VCR, penetration in major European markets tends to be significantly lower than in Japan and the United States. An estimated 41 percent of West German TV households own at least one VCR; in France it is only about 35.6 percent. As in the United States, feature films—notably American films—garner the lion's share of video sales, and industry sources witnessed a noticeable slump in business for retail outlets in 1989. In West Germany, the industry's failure to attract new consumer groups, an expansion in commercial TV channels, and new cable networks all have been cited for the recent drop in the number of video retailers.

Outlook for 1991

Revenue from video rentals and purchases should rise by 4 percent, assuming no substantial increase in inflation or fundamental economic downturn. The growth of videocassette purchases will depend to a large extent on the frequency of discounts. VCR sales to dealers will probably drop to 10 million to 11 million.

Long-Term Prospects

In percentage terms, projections are for more modest growth in video retail and VCR sales in the early 1990s than during the previous decade. Home video rentals and pur-

purchases should expand by approximately 6 percent through 1993, while VCR sales can be expected to level off at 9.5 million to 10 million annually. While video purchases will likely remain a significant share of home video business in the early- to mid-1990s, rentals should continue to be the primary source of revenue. The continuing popularity of video cameras will continue to prop up declining VCR purchases.

Although the industry will continue to benefit from the popularity of U.S.-made feature films, any major increases in viewership are more likely to occur only with the advent of new, cinema-quality video equipment that takes advantage of digital technology and fiber optic cable. A growing population of older U.S. viewers who prefer home entertainment should be a natural stimulus for such innovations.

In the meantime, the retail sector will shrink further as large chains, such as Blockbuster, continue to consolidate. And as the video industry matures, outlets may be forced to carry more video titles and increase their shelf capacity to attract customers.

Finally, U.S. home video sales abroad will be heavily influenced by the ability of the U.S. Government to obtain the cooperation of foreign governments in combating video piracy. The United States is also seeking international liberalization of trade in audio-visual products in the current round of GATT trade negotiations.

Cable Television

The cable television industry once more proved to be a powerful generator of revenue in 1989, providing a major alternative to network television. Cable nonetheless faces a number of challenges in the coming years. Not least of these is the possibility of legislation that would inevitably alter the competitive environment in which the industry operates. The industry also will encounter new rivals, such as direct broadcast satellite (dbs) services.

Cable's emergence as a serious challenger to broadcast networks is fully established, with 57.1 percent of U.S. households that have televisions sets also subscribing to cable. In contrast, only 7.5 percent of TV households subscribed to cable in 1970, and as recently as 1980 the figure was 22.6 percent. The average subscriber living in an American city that is wired for cable receives approximately 50 channels. About 9,000 cable systems or affiliates are served by about 72 basic cable networks that offer the standard cable package of channels for a monthly fee. Moreover, viewers can receive an additional dozen pay-TV services for about $10 per channel a month. Still another option is pay-per-view service, which provides about 13 million U.S. households with decoders that enable them to telephone for their choice of movies, sports, and other programs.

Like the major broadcast networks, basic cable networks sell advertising time. But unlike their older competitors, cable profits from the additional subscription fees. In 1989, cable operators collected $16.85 billion in total revenue, of which basic subscriptions amounted to about $8.74 billion, pay cable subscriptions $4.48 billion, and advertising revenue approximately $2 billion. Total revenue increased by 25.6 percent in 1989, while the 29 percent rise in advertising revenue reflected not only cable's sizable U.S. audience but also the escalating costs and scarcity of advertising time on major broadcast networks.

In tandem with its success, the industry has engendered controversy and consumer and congressional concerns over recent subscriber rate increases and concentration of ownership. According to a June 1990 General Accounting Office (GAO) report, the monthly cost of basic cable services rose to $15.95 in 1989, an increase of 10 percent over 1988. The typical subscriber's monthly bill, including premium channels and additional options such as a second cable hookup, was estimated at $26.36, a 5 percent increase over 1988. While the industry claims the lower increase in monthly bills is the more relevant measure of subscriber costs, consumer groups say this is due to the large number of subscribers who have dropped premium channels in the face of significantly higher basic rates.

Congressional and consumer groups' scrutiny has also turned to the subject of cable operator "tiering" of premium channels, observable in 1990, as well as a flurry of cable sports programming. In the expectation that basic rates will come under government regulation, some local operators have shifted popular channels, such as the Entertainment and Sports Programming Network (ESPN), from the basic cable networks to the unregulated premium channel tier. In addition, cable has come under criticism for signing expensive, exclusive sports broadcast agreements, which are said to promote tiering. There are also fears that siphoning athletic events from the major networks will create separate "pay TV/poor TV" audiences.

Attention has also focused on the degree of concentration in the cable industry, together with charges that U.S. cable firms have become locally unaccountable on matters of subscription rates and quality of service. Of particular concerns to critics is vertical concentration, which they contend keeps cable operators with a financial interest in programming from giving access to other media, such as satellite broadcasters and wireless cable, through exclusive arrangements. Cable operators, however, defend the arrangements as necessary to ensure a secure flow of quality programming. With respect to rates, the industry argues that during the years of regulation, fees were kept artifically low, hurting profits. As for the issue of local accountability, the National Cable Television Association announced voluntary service guidelines in 1990 to meet criticisms of cable customer service.

INTERNATIONAL COMPETITIVENESS

Outside the United States and Canada, where overall cable television penetration is well above 70 percent, the most promising areas of cable activity are Western Europe and East Asia. The emerging democracies in Eastern Europe offer some long-term promise, with the more immediate benefits falling to countries already engaged in cable construction.

In Western Europe, penetration of cable varies widely, ranging from more than 90 percent in Belgium to 41 percent in Denmark, 26 percent in West Germany, and virtually nil in Italy and Spain. The present low cable penetration in the United Kingdom, a mere 1.4 percent, may soon be reversed with the onset of stiff competition between dbs services Sky Television and British Satellite Broadcasting (BSB). Since the two services require different dishes and decoder boxes for reception, cable firms are offering viewers an attractive alternative of receiving all Sky and BSB channels by subscribing to cable and paying only cable installation costs. Moreover, U.K. law permits businesses to provide limited telephone and cable TV services through the same fiber optic network. The resulting lower construction cost creates a strong financial incentive for U.S. telephone companies, which own or hold majority shares in 73 percent of U.K. cable franchises, to invest in cable systems. For additional bacground, use chapter 29 (Telecommunications Services).

The countries of the Pacific Rim offer the most rapidly growing television market outside the United States and Europe. Some of the most lucrative gains have been posted in Hong Kong, where the telephone company, U.S. West, and three consortium partners secured a 15-year cable franchise for 3.5 million inhabitants and U.S. firms are providing financial and programming assistance. ESPN is a frequent provider of programming to Indonesia and Japan, where Cable News Network, Music TV, the Financial News Network, and the Discovery Channel are also shown.

It has been estimated that cable television in Japan is more than a decade behind U.S. levels of market penetration and program availability. Only 5.8 million households, roughly 18 percent of all Japanese TV homes, are wired for cable. Cable activity has largely been limited to retransmission of local broadcast signals, and there is considerable evidence that Japan's more homogenous population presents a narrower base for the special interest channels that have proven viable in the United States.

Outlook for 1991

If Congress had passed legislation to reregulate cable television in 1990, it certainly would have had a negative effect on revenue in 1991. The failure of attempts at compromise in the Senate ended this possibility. As a result, total revenue should increase about 15 percent during the year. Eventually, however, reregulation could lead to narrower profit margins. Financing for cable acquisitions should also remain precarious in the short term, with banks reluctant to supply loans for the highly leveraged transactions that have been an industry feature.

Long-Term Prospects

The industry's profit margins will likely continue to narrow through the early 1990s, particularly in view of the threat of rate caps and a market that is becoming saturated. Overall revenue growth should equal 5 to 8 percent, while an estimated 60 percent of U.S. television households will be wired for cable by 1993.

The main determinants of the industry's future health are regulatory, technological, and macroeconomic developments, as well as the staying power of emerging cable competitions. Regulatory measures, such as the maximum price level permitted for basic services and the degree of restriction placed on exclusive contracts between programmers and operators, would inevitably affect the financial state of the industry. Moreover, the number of new channels will continue to be limited by the restricted delivery capacity of most cable systems. Constraints on the number of program services will persist until fiber optic or similarly advanced delivery systems replace the existing coaxial cable network.

Given the demonstrated ability of telephone companies to deliver both telephone and video services on the same fiber optic cable, as in the United Kingdom, there is a strong technological imperative for the phone companies to enter the cable business. Although legislative attempts to sanction such entry foundered in 1990, it is likely that the phone companies will offer some video services in the future, albeit with regulatory conditions attached. A critical question is whether the phone companies will be given the right to own interests in cable programming. Without that right, the phone companies claim, they will have limited incentive to act as carriers of cable transmissions.

Cable will also face competition from dbs services K Prime Partners and Sky Cable, the first of which is expected to beam satellite programming by early 1991. This raises the possibility of new inroads on existing cable viewership in the 1990s.

Substantial opportunities for cable TV franchising, and sales of programming and equipment will continue to open abroad. One potentially promising market is unified Germany. The West German Ministry of Posts and Telecommunications will undertake the costly and complicated task of modernizing the East German telephone system, which will almost certainly force the agency to reduce its dominant role in domestic cable construction and installation.

The United Kingdom should also prove attractive for cable activity in the future. However, one source of uncertainty is a European Community broadcast directive that calls for a majority of European television programming in member states. Elsewhere, opportunities for U.S. firms will emerge in the more densely populated, higher-income areas of East Asia. Exploitation of the cable market in Japan, however, will require U.S. cable or motion picture companies to develop highly specialized programming and strategies for competing with ever-growing dbs services.—*Ernest Plock, Office of Service Industries, (202) 377-5820, September 1990.*

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Foods and Beverages

In 1991, constant-dollar shipments for the total food and beverage industry (SIC 20) will rise 1.5 percent, one-half percent below the 2 percent increase of 1990.

Table 1: Product Shipments for Selected 25 Food and Beverage Sectors, 1988–90

(in millions of current dollars)

SIC Code	Industry	1988	1989[1]	1990[1]
201	MEAT PRODUCTS	74,385	80,099	88,628
2011	Meat packing plants	43,108	45,739	49,831
2013	Sausage & other prepared meats	15,291	15,786	18,514
2015	Poultry slaughtering/processing	15,985	18,574	20,284
202	DAIRY PRODUCTS	41,289	43,370	48,471
2021	Creamery butter	1,741	1,766	1,455
2022	Cheese, natural & processed	10,849	11,785	14,009
2023	Dry, condensed, evaporated	6,176	6,439	7,228
2024	Ice cream & frozen desserts	4,574	4,602	4,948
2026	Fluid milk	17,949	18,778	20,831
203	PRESERVED FRUITS AND VEGETABLES	37,011	40,400	42,806
2032	Canned specialties	4,834	4,967	5,276
2033	Canned fruits & vegetables	12,837	14,465	15,554
2034	Dried fruits/vegetables & soups	2,106	2,607	2,490
2035	Pickles, sauces & salad dressings	4,825	5,207	5,531
2037	Frozen fruits & vegetables	6,872	7,170	7,490
2038	Frozen specialties, nec	5,538	5,985	6,465
204	GRAIN MILL PRODUCTS			
2043	Cereal breakfast foods	5,667	6,415	6,876
205	BAKERY PRODUCTS	20,956	22,733	24,256
2051	Bread, cake & the like	13,470	14,470	15,372
2052	Cookies & crackers	6,075	6,820	7,431
2053	Frozen bakery products, except bread	1,412	1,443	1,453
206	SUGAR AND CONFECTIONS			
2064	Candy products	7,474	7,825	8,240
208	BEVERAGES			
2082	Malt beverages	13,742	14,319	14,835
2084	Wine, brandy, & brandy spirits	3,523	3,830	4,127
2085	Distilled & blended liquors	3,194	3,361	3,611
2086	Soft drinks & carbonated water	20,809	21,990	23,320
SUBTOTAL		228,049	244,342	264,170
2091/92	Processed fishery products	5,501	6,645	6,800
TOTAL FOR 25 SECTORS		233,550	250,987	270,970
ESTIMATED TOTAL FOR ENTIRE FOOD & BEVERAGE INDUSTRY		328,875	353,506	383,652

[1] Estimate.

[2] Not elsewhere classified.

SOURCE: U.S. Department of Commerce, Bureau of Census and International Trade Administration.

The 25 food and beverage sectors covered in this chapter account for 71 percent of the value of all shipments of the food and beverage industry. These 25 sectors are meat and poultry (SIC 2011, 2013, 2015), dairy goods (SIC 2021, 2022, 2023, 2024, 2026), processed fruits, vegetables, and specialty foods (SIC 2032, 2033, 2034, 2035, 2037, 2038), breakfast cereals (SIC 2043), bakery products (SIC 2051, 2052, 2053), confectionery products (SIC 2064), alcoholic beverages (SIC 2082, 2084, 2085), soft drinks (SIC 2086), and seafood products (SIC 2091, 2092). Seafood data is not collected in strict accordance with the SIC codes, which normally cover only in-plant processing. The data in the seafood segment include harvesting (employment data), landings (the value of fish on the dock), and processing (employment and the value of finished products). Food sectors not covered in this chapter include fats and oils, animal feeds, sugar, coffee, grain mill products, and some snack foods.

The food and beverage industry is the second largest of all U.S. manufacturing sectors. The value of food and beverage industry shipments rose from $353.5 billion in 1989 to $381.7 billion in 1990, or 13 percent of total shipments of all U.S. manufactured products.

Before reading this chapter, please see "How to Get the Most Out of This Book" on page 1. It will clarify questions you may have concerning data collection procedures, factors affecting trade data, forecasting methodology, the use of constant dollars, the difference between industry and product data, sources and references, and the Standard Industrial Classification system (SIC). For other topics related to this chapter, see chapters 10 (Paper and Allied Products), 11 (Cans and Containers), 18 (Advanced Materials: Biotechnology), and 35 (Leather and Leather Products).

In 1991, the aggregate real value of shipments by these 25 industries, which produce most of the high value-added packaged food products consumed in the United States (cookies, alcoholic beverages, bakery goods, and breakfast cereals), will increase about 1.6 percent. Breakfast cereals, red meats, and alcoholic beverages will increase approximately 1 percent; poultry products will rise almost 7 percent.

Population growth, demographic changes, increased purchases of value-added products, and the introduction of new value-added products are all major determinates for this rise. In 1991, while total population will rise 0.8 percent, the set of consumers aged 35 to 54 years will increase 3.2 percent. These consumers are frequently at the peak of their earning potential, and are more frequent purchasers of new and higher value-added products.

INTERNATIONAL TRADE

The U.S. food industry is home-market oriented and exports less than 4 percent of domestic production, whereas many other developed countries export from 10 to 70 percent of their food production.

The United States generally exports such low value-added processed foods as fats and oils; grain mill products (excluding breakfast cereals); and meat, poultry, and fish products. U.S. food imports are generally high value-added foods, including confections, bakery goods, alcoholic beverages, and gourmet fruit and vegetable products. In 1990, about two-thirds of U.S. exports were low value-added items, while more than half the imports were high value-added products.

U.S. Exports and Imports
Selected Foods & Beverages
(in millions of dollars except as noted)

SIC	Industry	1989	1990[1]	1991[2]	Percent Change 1989–90[3]	Percent Change 1990–91
201A	Red Meat					
	Value of exports	3,951	4,113	—	4.1	—
	Value of imports	2,752	3,052	—	10.9	—
2015	Poultry slaughtering and processing					
	Value of exports	548	714	—	30.3	—
	Value of imports	38.2	26.5	—	−30.6	—
2021	Creamery butter					
	Value of exports	54.0	132	119	144.4	−9.8
	Value of imports	3.9	2.4	1.9	−38.5	−20.8
2022	Cheese, natural and processed					
	Value of exports	24.8	36.2	55.4	46.0	53.0
	Value of imports	381	512	615	34.4	20.1
2023	Dry, condensed, evaporated products					
	Value of exports	355	182	218	−48.7	19.8
	Value of imports	344	389	408	13.1	4.9
2024	Ice cream and frozen desserts					
	Value of exports	11.1	14.2	19.9	27.9	40.0
	Value of imports	0.1	0.0	0.0	−100.0	—
2026	Fluid milk					
	Value of exports	28.9	46.4	69.4	60.6	49.6
	Value of imports	10.8	0.2	0.3	−98.1	50.0
203A	Canned Foods					
	Value of exports	1,653	1,910	—	15.5	—
	Value of imports	1,662	1,518	—	−8.6	—
203B	Frozen Foods					
	Value of exports	478	554	—	15.9	—
	Value of imports	661	1,089	—	64.8	—
2043	Cereal breakfast foods					
	Value of exports	15.6	30.7	48.5	96.8	58.0
	Value of imports	38.3	46.1	55.2	20.4	19.7
2051	Bread, cake, and related products					
	Value of exports	48.2	106	135	119.9	27.4
	Value of imports	240	245	247	2.1	0.8
2052	Cookies and crackers					
	Value of exports	65.8	89	101	35.3	13.5
	Value of imports	89.9	110	122	22.4	10.9
2053	Frozen bakery products, except bread					
	Value of exports	11.0	14.2	20.0	29.1	40.8
	Value of imports	13.6	12.6	12.4	−7.4	−1.6
2064	Candy & other confectionery products					
	Value of exports	174	209	—	20.1	—
	Value of imports	194	216	—	11.3	—
2082	Malt beverages					
	Value of exports	109	135	—	23.9	—
	Value of imports	870	911	—	4.7	—
2084	Wines, brandy, and brandy spirits					
	Value of exports	104	117	—	12.5	—
	Value of imports	1,130	1,114	—	−1.4	—
2085	Distilled and blended liquors					
	Value of exports	242	290	—	19.8	—
	Value of imports	1,165	1,328	—	14.0	—
2086	Bottled and canned soft drinks					
	Value of exports	101	85.0	—	−15.8	—
	Value of imports	175	190	—	8.6	—
	Selected Foods & Beverages					
	Value of exports	7,974	8,778	—	10.1	—
	Value of imports	9,769	10,762	—	10.2	—

[1] Estimate

[2] Forecast.

[3] Changes in exports where Canada is a significant trading partner may be overstated due to modifications in data collection procedures. (See "How to Get the Most Out of This Book).

SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA). Estimates and forecasts by ITA.

In 1990, the 25 food and beverage industries covered in this chapter experienced a trade deficit. While U.S. exports of processed foods and beverages, excluding seafood, rose 10 percent to $8.8 billion, imports also climbed 10 percent to $10.8 billion, as shown in the trade tables.

U.S. Trade Patterns in 1989
Selected Foods and Beverages
SIC 201,202,203,2043,205,2064,2082,2084,2085,2086
(in millions of dollars, percent)

Exports	Value	Share	Imports	Value	Share
Canada & Mexico	1,474	18.5	Canada & Mexico	1,967	20.1
South America	61	0.8	South America	823	8.4
European Community	551	6.9	European Community	2,401	24.6
East Asia NICs	1,499	18.8	East Asia NICs	523	5.4
Japan	3,081	38.6	Japan	112	1.1
Other	1,308	16.4	Other	3,943	40.4
World Total	7,974	100.0	World Total	9,769	100.0

Top Five Countries

	Value	Share		Value	Share
Japan	3,081	38.8	Canada	1,427	14.6
South Korea	835	10.5	France	904	9.2
Canada	745	9.4	Australia	753	7.7
Mexico	728	9.2	New Zealand	724	7.4
Hong Kong	267	3.4	United Kingdom	577	5.9

See "How to Get the Most Out of This Book" for definitions of the Country Groupings.

SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA).

Japan, Korea, Canada, and Mexico, our major export markets, account for two-thirds of all U.S. food exports. The bulk of these exports are low value-added items. The European Community (EC) supplies 25 percent of U.S. imports; exports to the United States mostly high value-added products.

U.S. exports could be adversely affected by the strengthening of the internal economy of Europe under EC92, and by different packaging and environmental requirements (for example, all bottles and jars sold in the European Community may be required to be returnable or recyclable). Therefore, a number of U.S. food and beverage companies are seeking new business relationships within the EC.

EC92 is the merger of 12 Western European countries, which constitute a single market of 325 million people with a Gross Domestic Product of $4.5 trillion. Although not expecting to be fully operational until 1992, the EC member countries are already gearing up for competition with other world markets.—*Donald A. Hodgen, William V. Janis, Cornelius Kenney, Office of Consumer Goods, (202) 377-3346/2250/2428, October 1990.*

MEAT AND POULTRY PRODUCTS

In 1990, current-dollar shipments by the meat and poultry products industries rose about 10.7 percent, to $97.2 billion. Adjusted for inflation, shipments increased 0.4 percent.

This sector includes two major industries: red meat and poultry. The red meat industry, which produces primarily beef and pork, includes meat-packing plants (SIC 2011) and establishments that prepare sausage and other processed meats (SIC 2013). The poultry industry (SIC 2015) consists of plants that slaughter chickens, turkeys, rabbit, and other small game, or manufacture products from such meats; and establishments that process egg products. In 1990, the red meat industry accounted for about 78 percent of the value of all meat and poultry industry shipments, down from 81 percent in 1987.

Patterns of Consumption

During the past decade, consumer demand for convenience and concerns about diet and health shifted consumption toward poultry. Poultry now accounts for 37 percent of all meat consumed, up from 26 percent in 1981. Part of this increase is due to the fact that poultry products cost less and are therefore used more than red meat in frozen entrees and other convenience foods. During 1989/90, the average wholesale prices for beef and pork were $1.18 and $0.68 per pound, respectively, compared to $0.56 for chicken and $0.67 for turkey. Retail prices had a similar spread: beef, $2.46 per pound; pork, $1.94; and $1.00 to $1.50 for poultry.

Based on the boneless, trimmed weight of these products, per capita consumption of chicken and turkey equalled that of beef for the first time in 1990—an estimated 63.9 pounds. Per capita consumption of poultry increased 15.6 percent between 1987 and 1990, while beef consumption declined 7.7 percent, as shown in Table 2.

Red Meat Industry

The estimated current-dollar value of shipments by the red meat industry rose 11 percent in 1990. Shipments by meat packers were $54.5 billion; shipments by sausage and meat processors were $25.0 billion. Industry shipments adjusted for price fell 1.3 percent as red meat production declined about 1.5 percent to 38.8 billion pounds.

The meat-packing industry has become more concentrated with a number of mergers and consolidations. The *1987 Census of Manufactures* found 2,562 companies in the red meat industry in 1987, compared to 2,851 in 1982. In 1989, the top three firms controlled over 70 percent of total cattle slaughter. All three are rapidly moving toward the same degree of industry concentration in fresh pork production, as they all have major renovation and/or new construction projects near completion.

The red meat industry continues to improve profits through product innovations and closing of inefficient plants. Between 1987 and 1989, the number of federally-inspected meat plants dropped 14.6 percent to 2,814. Apparently, more red meat companies are expanding into the poultry business, and vice versa. Between 1987 and 1989, the number of establishments with both federal meat and poultry inspection increased by 108 to 3,318 plants.

Also, in an effort to compensate for declining beef consumption, meat packers are shifting away from commodity products and moving into branded and other value-added items. Non-carcass beef shipped from meat plants now accounts for seven-eighths of total beef production, compared to one-half in 1981.

Red Meat Imports

The value of U.S. red meat imports rose almost $300 million to $3.1 billion in 1990, an 11 percent increase from 1989. During the first half of 1990, total imports of fresh/chilled/frozen beef, veal, and pork were 12 percent above the same period in 1989. Sixty percent of the imports were beef products, 32 percent were pork products. Four red meat product categories accounted for two-thirds of total imports: frozen boneless beef (45 percent), hams (12 percent), canned corn beef (6 percent), and sausage casings (4 percent), as shown in Table 3.

Table 2: U.S. Per Capita Consumption of Meat Products, 1966–90

(in pounds[1])

Year	Red Meat				Poultry	All Meat Products
	Total	Beef	Pork	Other[2]		
1966	123.8	73.7	44.3	5.8	30.9	154.7
1971	135.5	79.0	52.6	4.0	34.3	169.8
1976	132.1	88.9	39.2	3.9	36.5	168.7
1981	121.9	72.7	46.8	2.3	43.9	165.8
1986	118.3	74.1	41.6	2.6	51.1	169.4
1987	113.3	69.2	41.8	2.3	55.3	168.6
1988	115.1	68.2	44.7	2.2	57.1	172.2
1989	111.3	65.0	44.3	2.1	60.5	171.8
1990[3]	108.5	63.9	42.6	2.0	63.9	172.4

[1] Boneless equivalent for poultry and red meat subtracts all bone and the fat that is normally trimmed before retail sale. In 1990, the United States Department of Agriculture (USDA) revised its red meat and poultry consumption series to reflect changes in marketing practices and to facilitate comparisons of red meat and poultry on an equivalent basis.

[2] Veal and lamb.

[3] Estimate

SOURCE: *Food Consumption, Prices, and Expenditures*, SB-804, U.S. Department of Agriculture, Economic Research Service, May 1990.

USDA/Larry Rana

In 1990, the red meat industry accounted for about 78 percent of the value of all meat and poultry industry shipments, down from 81 percent in 1987. In an effort to compensate for declining beef consumption, meat packers are shifting away from commodity products and moving into branded and other value-added items.

Trends and Forecasts: Red Meat (SIC 2011,2013)

(in millions of dollars except as noted)

Item	1987	1988[1]	1989[2]	1990[2]	1991[3]	Percent Change 1987–88	1988–89	1989–90	1990–91
Industry Data									
Value of shipments[4]	61,613	64,800	68,474	76,102	—	5.2	5.7	11.1	—
Value of shipments (1987$)	61,613	63,986	64,087	63,270	63,541	3.9	0.2	−1.3	0.4
Total employment (000)	192	200	206	208	—	4.2	3.0	1.0	—
Production workers (000)	153	160	165	168	—	4.6	3.1	1.8	—
Average hourly earnings ($)	8.50	8.51	8.64	8.77	—	0.1	1.5	1.5	—
Capital expenditures	499	661	—	—	—	32.5	—	—	—
Product Data									
Value of shipments[5]	55,109	58,399	61,525	68,345	—	6.0	5.4	11.1	—
Value of shipments (1987$)	55,110	57,901	57,743	57,009	57,250	5.1	−0.3	−1.3	0.4

[1] Advance data from the 1988 Annual Survey of Manufactures.

[2] Estimate.

[3] Forecast.

[4] Value of all products and services sold by establishments in the red meat industry.

[5] Value of products classified in the red meat industry produced by all industries.

SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA). Estimates and forecasts by ITA.

Table 3: Major U.S. Imports of Red Meats, and Suppliers, 1990

Product	Percent Share of U.S. Red Meat Imports	Major Supplier and Their Percent Share	
Frozen boneless beef	45	Australia	55
		New Zealand	38
Hams	12	Denmark	48
		Poland	20
		Netherlands	5
Canned beef	6	Brasil	22
		Argentina	21
Sausage casings	4	West Germany	30
		New Zealand	20
		Mexico	10
		Netherlands	9
		Belgium	7

SOURCE: U.S. Department of Commerce, International Trade Administration.

In 1990, 86 percent of all U.S. red meat imports came from five countries: Australia (26 percent), Canada (22 percent), New Zealand (19 percent), Denmark (10 percent), and Argentina (6 percent), as shown in Table 3. Australia and New Zealand supplied over 70 percent of our beef and veal imports, as shown in Table 4. Canada and Denmark accounted for 76 percent of total pork imports.

The net increase in red meat imports was due to several factors. Although imports from New Zealand fell 21 percent during the first six months of 1990, as the country attempted to rebuild its herds following last year's drought, and imports of sausage casings fell 15 percent, imports from Australia rose 51 percent, canned meat imports rose 35 percent, hams rose 7 percent, and frozen boneless beef increased 11 percent.

Table 4: Major U.S. Suppliers of Red Meat Products, 1990

Country	Percent Share of U.S. Red Meat Imports	Product and Percent of Total Red Meat Exports to the U.S.	
Australia	26	Frozen boneless beef	96
Canada	22	Fresh/chilled pork	35
		Hams	25
		Other fresh/chilled/ frozen beef	25
New Zealand	19	Frozen boneless beef	90
Denmark	10	Canned hams	46
		Frozen pork	26
Argentina	6	Canned corn beef	28
		Other canned meats	68

SOURCE: U.S. Department of Commerce, International Trade Administration.

Red Meat Exports

In 1990, U.S. red meat exports, which include cattlehides, increased only 4 percent to $4.1 billion due to only a modest increase in U.S. exports to Japan. Cattlehides accounted for about 36 percent of total red meat product exports; beef products, 33 percent; offals, 9 percent; and pork products, 8 percent, as shown in Table 5. Five countries absorbed 88 percent of total U.S. red meat exports: Japan, 46 percent; South Korea, 23 percent; Canada, 10 percent; Mexico, 6 percent; and Taiwan, 3 percent, as shown in Table 6.

Table 5: Major U.S. Red Meat Exports and Destinations, 1990

Product	Percent Share of U.S. Red Meat Exports	Major Country Destination and Its Percent Share	
Hides and skins	36	South Korea	50
		Japan	26
		Taiwan	7
		Mexico	5
Beef products	33	Japan	64
		Canada	19
		South Korea	6
		Mexico	5
Offals	9	Japan	74
		Mexico	10
		Canada	4
Pork products	8	Japan	80
		Mexico	8

SOURCE: U.S. Department of Commerce, International Trade Administration.

In 1990, Japan accounted for two-thirds of total U.S. beef exports. Exports to Japan were off about 10 percent during the first half of 1990, compared to the same period in 1989, due to large inventories of frozen beef, but picked up the last half of 1990 as prices declined.

Japan also accounted for almost 80 percent of total U.S. pork exports. Exports to Japan increased 30 percent during the first half of 1990, but slowed in the second half as Taiwan regained the lead as the major pork exporter to Japan due to lower transportation costs. In 1988, the Taiwan pork industry had a quality problem—sulfamethazine residue—and the United States had helped fill the void.

Table 6: Top Five U.S. Export Markets for Red Meat, 1990

Country	Percent Share of U.S. Red Meat Exports	Major Export and Percent Share	
Japan	45.6	Frozen boneless beef	34
		Hides and skins	23
		Other beef products	15
		Frozen pork products	8
		Other pork products	5
South Korea	22.6	Hides and skins	90
		Frozen boneless beef	8
Canada	10.2	Fresh/chilled beef	60
		Hides and skins	15
		Other beef products	9
Mexico	6.3	Hides and skins	32
		Beef and pork offals	20
		Carcasses of beef	13
		Sausage casings	5
Taiwan	3.1	Hides and skins	89
		Frozen boneless beef	6

SOURCE: U.S. Department of Commerce, International Trade Administration.

U.S.-EC Disputes

The export-oriented meat industry is still seeking a resolution of the plant inspection difficulties it has with the European Community (EC). Current EC sanitation and health regulations differ from U.S. regulations, limiting the number of U.S. meat plants that are able to export to the EC. Also, since the EC continues to ban imports of hormone-treated meats, with the exception of pet food, the United States continues to levy a 100% import tariff on a list of European food products.

Poultry and Related Industries

In 1990, the estimated current-dollar value of shipments by the poultry slaughtering and processing industry rose 9.0 percent to $21.1 billion. Industry shipments, adjusted for price changes, increased 6.8 percent. Per capita consumption has increased from 43.9 pounds in 1981 to 63.9 pounds in 1990. Production reached a record 23.6 billion pounds in 1990, a 7.3 percent increase over 1989.

Net returns for all of 1990 were slightly lower than in 1989. During the first half of 1990, returns averaged about 10.5 cents per pound, down from 13.2 cents a year earlier. Positive returns in the first half were assisted by a 2–3 cent per pound drop in feed costs. Higher feed costs during the second half of 1990 resulted in lower second half net returns.

Turkey producers, at best, will break even in 1990. Since turkeys take longer than broilers to mature before slaughter, production costs for turkeys are double, with wholesale prices only 12 percent higher.

As with the red meat industry, the poultry industry is becoming more concentrated. According to the *Census of Manufactures*, 367 companies were in the poultry business in 1982, and only 308 in 1987. The top four firms accounted for over 50 percent of total production. Processors, in the need of more chickens, are building more hatcheries and plants, or buying their competitors. While the number of federally-inspected red meat plants has declined over the years, the number of federally-inspected poultry plants has increased. Between 1988 and 1989, three new poultry plants were added, while 200 meat plants were closed.

Trade in Poultry Products

In 1990, U.S. exports of poultry increased 30.3 percent, to $714 million, surpassing its previous record, set in 1981, by $161 million. Poultry parts continue to dominate the export market. In 1990, parts were about 92 percent of chicken and turkey exports compared with 40 percent in 1981. In 1990, exports to Japan were 99 percent parts; 100 percent of the exports to the Soviet Union were parts.

Although exports to Japan were flat in 1990, exports to other major trading partners were up significantly. Also, for the first time in recent history, the U.S.S.R. is a major importer of U.S. poultry. In 1990, twelve U.S. poultry processors formed an export trading company, American Poultry USA, to sell the Soviets 69 million kg of chicken, valued at $50 million.

The top five U.S. export markets for U.S. poultry products accounted for 74 percent of total U.S. exports: Japan, 20.6 percent; Canada, 19.2 percent; the Soviet Union, 14.5 percent; Hong Kong, 12.6 percent; and Mexico, 7.1 percent, as shown in Table 7.

U.S. imports fell a net 30 percent in 1990, to $26.5 million. Frogs legs and goose liver imports were down 90 percent and 42 percent, respectively, while deer meat rose 11 percent. Six countries accounted for 94 percent of U.S. imports: Canada, 58 percent; Israel, 13 percent; New Zealand, 13 percent; France, 6 percent; and Taiwan and Bangladesh, each with 2 percent, as shown in Table 8.

The United States is the most efficient producer of chicken and turkey in the world and so imports very little in

Trends and Forecasts: Poultry Slaughtering and Processing (SIC 2015)

(in millions of dollars except as noted)

Item	1987	1988[1]	1989[2]	1990[2]	1991[3]	Percent Change 1987–88	1988–89	1989–90	1990–91
Industry Data									
Value of shipments[4]	14,912	16,628	19,372	21,123	—	11.5	16.5	9.0	—
Value of shipments (1987$)	14,912	15,486	16,614	17,750	18,950	3.8	7.3	6.8	6.8
Total employment (000)	148	156	166	173	—	5.4	6.4	4.2	
Production workers (000)	132	139	148	154	—	5.3	6.5	4.1	—
Average hourly earnings ($)	6.16	6.39	6.70	7.04	—	3.7	4.9	5.1	—
Capital expenditures	387	341	—	—	—	−11.9	—	—	—
Product Data									
Value of shipments[5]	14,298	15,985	18,574	20,284	—	11.8	16.2	9.2	—
Value of shipments (1987$)	14,298	14,887	15,930	17,045	18,290	4.1	7.0	7.0	6.8

[1] Advance data from the 1988 Annual Survey of Manufactures.

[2] Estimate.

[3] Forecast.

[4] Value of all products and services sold by establishments in the poultry slaughtering and processing industry.

[5] Value of products classified in the poultry slaughtering and processing industry produced by all industries.

SOURCE: U.S. Department of Commerce: Bureau of the Census, International Trade Administration (ITA). Estimates and forecasts by ITA.

Table 7: Top Five U.S. Poultry Export Markets, 1990

Country	Percent Share of U.S. Poultry Exports	Major Export and Percent Share	
Japan	20.6	Frozen chicken parts	83
		Frozen whole broilers	3
Canada	19.2	Fresh/chilled chicken parts	32
		Poultry offals	37
		Frozen chicken parts	12
Soviet Union	14.5	Frozen chicken parts	100
Hong Kong	12.6	Frozen chicken parts	89
Mexico	7.1	Frozen chicken parts	49
		Fresh/chilled chicken parts	22
		Turkey parts	8

SOURCE: U.S. Department of Commerce, International Trade Administration

that category. Four products accounted for two-thirds of the 1990 U.S. imports of poultry and related products: frogs legs, 38 percent; chicken pate, 12 percent; deer meat, 11 percent; and goose liver, 5 percent. This accounted for a total of less than 0.2 percent of domestic poultry products consumption.

There is little commercial production of goose liver and frogs legs in the United States. France supplies 88 percent of the goose liver consumed in the United States; Bangladesh and Indonesia supply 55 percent and 45 percent, respectively of imported frogs legs; Canada and Israel accounted for practically all chicken pate imports (72 percent and 27 percent, respectively); and over 93 percent of U.S. deer meat imports came from New Zealand.

Outlook for 1991

Constant-dollar industry shipments of red meats are expected to increase less than 1 percent, production will remain relatively flat, and per capita consumption will fall 1 percent to 107.4 pounds. To compensate for this decrease, red meat processors will emphasize more value-added products. Industry consolidation will result in a decline in the number of federally-inspected red meat plants.

The beef industry may benefit from Japan lifting all beef import quotas in April. At that time, the duty will be 70 percent, then will decline 10 percent a year, down to 50 percent by 1993.

The poultry industry will experience a 6.8 percent growth in the constant-dollar value of shipments as poultry production increases an estimated 5-7 percent. The broiler industry will continue to be profitable as strong broiler prices offset moderate feed costs.

Table 8: Major U.S. Suppliers of Poultry Products, 1990

Country	Percent Share of U.S. Poultry Imports	Product and Percent of Total Poultry Exports to the U.S.	
Canada	58	Poultry cuts and edible offal, including liver	45
Israel	13	Fresh/chilled/frozen turkey	34
		Turkey liver	19
		Other poultry offal	15
New Zealand	13	Deer meat	100
France	6	Goose liver	75
Taiwan	2	Egg products	100
Bangladesh	2	Frogs legs	100

SOURCE: U.S. Department of Commerce, International Trade Administration.

Per capita poultry consumption will increase to over 67 pounds, accounting for 38 percent of all meat consumed. As per capita consumption increases, so will the share of higher value-added poultry products. In 1991, higher value-added processed chicken items will account for almost 30 percent of total chicken consumed, up from 12 percent in 1981.

Long-Term Prospects

Between 1991 and 1995, the value of shipments by the meat and poultry products industry is expected to grow 1 to 2 percent annually, adjusted for price changes. Exports should have a greater increase, 9 percent a year, to $7 billion. The Pacific Rim will continue to be the major export market. By 1995, poultry exports should account for 28 percent of total exports of meat and meat products, up from 16 percent in 1991.

Total red meat per capita consumption including beef, pork, veal, and lamb, will hover around 106 to 108 pounds during the next five years. The red meat industry will continue to improve profits through product innovations and the closing of inefficient plants. More red meat processors will diversify and market more value-added products that will meet consumers' demands for convenience and nutrition.

By 1995, there will be 25 percent more meat/poultry plants than only-meat plants. The number of only-poultry plants will also decline, reflecting an industry trend toward providing both red meat and poultry and, in some cases, fish.

By 1995, the poultry industry could account for 26 percent of total shipments of the meat and poultry products, as per capita consumption of chicken and turkey increases from 37 percent of total meat consumption in 1990 to almost 41 percent by 1995, or 74 pounds per person. The poultry industry will continue to provide new and better poultry products to meet the needs of a demographically changing society. People tend to eat less red meat and more poultry after age 44. More freshly prepared/cooked types of products, such as ground turkey/chicken and turkey sausages, will appear on supermarket shelves.—*Donald A. Hodgen, Office of Consumer Goods, (202) 377-3346, September 1990.*

Additional References

(Call the Bureau of the Census at 301-763-4100 for information about how to order Census documents.)

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AMI Newsletter and *Meat Facts* 1990, American Meat Institute, P.O. Box 3556, Washington, DC 20007. Telephone: (703) 841-2400.

Meat and Poultry, Oman Publishing Co., P.O. Box 1059, Mill Valley, CA 94942. Telephone: (415) 388-7575.

Directions: The State of the Beef Industry, National Cattlemen's Association, P.O. Box 3469, Englewood, CO 80155. Telephone: (303) 694-0305.

SEAFOOD PRODUCTS

Industry records were set in the first half of 1990 in the quantity of fish landed, the value of processed fishery products, per capita consumption, and the export of edible fishery products. These trends are predicted to continue.

The data for the seafood products industry is not collected in strict accordance with SIC 2091 and 2092, which cover only in-plant processing. The data presented here include harvesting (employment data), landings (the value of fish on the dock), and processing (in-plant employment and the value of finished products).

The record landings in 1989, shown in Table 9, were in part due to large increases in landings of Alaskan pollock and Pacific salmon, which were up 88%, and 30% respectively, from 1988. In spite of the dramatic increase in the pollock landings, average pollock prices remained constant in current dollars. Average salmon exvessel prices, however, fell to approximately half their 1988 level. The large increase in landings of these species more than compensated for the decline in landings of some species due to efforts to rebuild these stocks.

Table 9:. U.S. Commercial Landings of Fish and Shellfish, 1980–89

(in millions)

Year	Landings	
	Pounds	Dollars
1980	3,654	2,092
1981	3,547	2,277
1982	3,285	2,247
1983	3,238	2,203
1984	3,320	2,206
1985	3,294	2,198
1986	3,393	2,641
1987	3,946	2,979
1988	4,588	3,362
1989	6,204	3,111

SOURCE: *Fisheries of the United State 1989*, U.S. Department of Commerce, National Marine Fisheries Service.

Per capita consumption of fish and shellfish increased in 1989 to a record 15.9 pounds, shown in Table 10. The high interest in health and diet during the last few years has resulted in diets that are lower in red meat and higher in fish and poultry. Joint industry and government promotional campaigns also contributed to the rise in consumption. The profile of seafood consumption has changed over the years. Consumption of fresh and frozen products has had short run increases and decreases, but has increased over the long run. Canned product consumption increased in 1989, mostly due to increased tuna consumption. Canned salmon and sardine consumption declined or remained constant. Canned tuna alone accounts for 25 percent of per capita consumption, the largest single category. Cured product consumption has remained constant in recent years.

Among the fishery products that have earned the approval of consumers are the so-called analog products, made from a fish paste called surimi. The most prevalent products are those that resemble crab legs and shrimp. Surimi-based products are marketed domestically, and surimi itself is exported, particularly to Japan, where large quantities are used in various products.

Table 10: U.S. Per Capita Consumption of Commercial Fish and Shellfish, 1980–89

(pounds of edible meat per person)

Year	Fresh and Frozen	Canned	Cured	Total
1980	8.0	4.5	0.3	12.8
1981	7.8	4.8	0.3	12.9
1982	7.7	4.3	0.3	12.3
1983	8.0	4.8	0.3	13.1
1984	8.5	4.9	0.3	13.7
1985	9.0	5.1	0.3	14.4
1986	9.0	5.4	0.3	14.7
1987	10.3	5.1	0.3	15.7
1988	10.2	4.7	0.3	15.2
1989	10.5	5.1	0.3	15.9

NOTE: The 1989 per capita consumption should not be directly compared to per capita consumption in the years 1986–1988 because calculation methodology was modified in 1989 to reflect surimi production. Surimi was domestically produced during the past three years, but data were unavailable for use in per capita consumption calculation. An estimate for surimi production was available for the first time in 1989.

SOURCE: *Fisheries of the United States, 1989*, U.S. Department of Commerce, National Marine Fisheries Service.

INTERNATIONAL TRADE

In the first half of 1990, the trends in U.S. fisheries trading continued to be favorable; imports of edible products fell to $2.52 billion, exports rose to $1.18 billion, and the fisheries trade deficit continued to decline. In real terms, the fisheries trade deficit reached its lowest point since 1985. These trends are expected to continue.

The reasons for the decreasing deficit are complex and include such diverse determinants as consumers' tastes and preferences (including health and diet), exchange rates, and availability of fishery stocks. Another factor is the role of the U.S. government in facilitating world trade. The Japanese market has become more open to U.S. products as a result of bilateral negotiations on the export of U.S. roe herring and Alaskan pollock to Japan. Also, the United States and Canada implemented a Free Trade Agreement on January 1, 1989. In other forums, especially the General Agreement on Tariffs and Trade and the Organization for Economic Cooperation and Development, the United States is working to further liberalize trade in fishery products.

Outlook for 1991

Current trends are expected to continue during 1991. Landings will increase slightly as efforts continue to develop markets for such underutilized species as mackerel, hake, Gulf butterfish, and others. The renewed interest in fish by the U.S. consumer will keep the demand high for all seafood and particularly for specialty items. Per capita consumption of seafood products may exceed sixteen pounds.

Long-Term Prospects

In the long term, domestic demand for seafood is expected to continue to grow, due to the combined effect of continued modest growth in per capita consumption and the increasing popularity of frozen specialty products. Export opportunities will also continue to be strong, as evidenced by the recent rise in fisheries exports due to the new international agreements.

There is also considerable investment opportunity and growth potential in marine aquaculture, which in the United States involves pond-raised salmon and catfish.—*Prudence Fox, William Bellows, Trade Services Division, National Marine Fisheries Service, Telephone (301) 427-2379, September 1990.*

Trends and Forecasts: Fisheries Landings and Fishery Product

(in millions of dollars)

Item	1987	1988	1989	1990	Percent Change 1987-88	Percent Change 1988-89
Industry Data						
Value of edible processed product	5,654	5,501	6,645	6,800[1]	-2.7	20.8
Value of edible commercial landings	2,979	3,362	3,111	3,180[1]	12.9	-7.5
Value of edible processed product (1987 $)	5,654	5,290	5,905	—	-6.4	11.6
Value of edible commercial landings (1987 $)	2,979	3,233	2,850	—	8.5	-11.8
Harvesting and processing (total employment in thousands)	359	364	364[1]	—		
Processing & wholesaling employment[2] (number in thousands)	103	90	91[1]	—		
Trade Data						
Value of edible imports	5,711	5,442	5,498	5,140[1]	-4.7	1.0
Value of edible exports	1,578	2,156	2,283	2,510[1]	36.6	5.9
Value of edible imports (1987 $)	5,711	5,233	5,039	—	-8.4	-3.7
Value of edible exports (1987 $)	1,578	2,073	2,093	—	31.4	1.0

[1] Estimate.

[2] Included in total employment.

SOURCE: *Fisheries of the United States*, 1987, 1988, and 1989 editions, Department of Commerce, National Marine Fisheries Service.

PROCESSED FRUITS, VEGETABLES, AND SPECIALTIES

In 1990, estimated current-dollar shipments of the fruit, vegetable, and specialty processing industries increased 5.8 percent to $44.1 billion. In constant dollars, the increase was 2.0 percent.

This sector includes two major industries: canned goods and frozen foods. Canned goods producers manufacture or can baby food, ethnic foods, and soups (SIC 2032); process fruits, vegetables, juices, tomato products, jams, jellies, and preserves (SIC 2033); package dry fruits and vegetables or manufacture soup mixes from dehydrated ingredients (SIC 2034); or process salad dressings, relishes, seasonings, and pickles (SIC 2035). Frozen food industry establishments freeze fruits, fruit juices, and vegetables (SIC 2037), or manufacture such specialty foods such as frozen dinners, waffles, soups, whipped toppings, and pizzas (SIC 2038).

Patterns of Consumption

As indicated in Table 11, total per capita consumption of canned fruits and vegetables has declined in the past 10 years, while consumption of fresh and/or frozen products has increased.

Per capita consumption of all canned fruits declined from 20.8 percent of total fruit consumption in the 1980-84 period to 18.4 percent in the 1985-88 period. Fresh fruit consumption increased from 68.8 percent to 70.3 percer during the same years. Per capita consumption of vegetables followed a similar pattern. Canned vegetables decline from 46 percent to 43 percent while consumption of fresl vegetables rose from 45.7 percent to 48.1 percent, anc frozen rose from 8.3 percent to 8.4 percent.

Table 11: Per Capita Consumption of Some Maj Fruits and Vegetables

(in pounds)

Product	1976-78	1981-83	198
Consumption Up			
Fresh broccoli	1.0	1.9	
Fresh cauliflower	0.9	1.5	2
Fresh grapes	2.9	4.6	6
Fresh carrots	5.6	7.1	9
Fresh tomatoes	10.8	11.4	14
Fresh onions	12.6	13.8	16
Fresh apples	16.5	17.1	19
Frozen broccoli	1.2	1.5	2
Frozen corn	6.5	6.2	7.
Frozen potatoes	20.8	19.3	22.
Orange juice (gallons)	4.4	4.5	4
Consumption Down			
Canned green peas	2.9	2.5	2
Canned peaches	4.6	3.4	3
Canned corn	13.5	11.7	10.8

SOURCE: U.S. Department of Agriculture.

Canned Goods

The estimated current-dollar value of production of canned fruits, vegetables, and processed food specialties grew 6 per-

Trends and Forecasts: Canned Foods (SIC 2032-5)

(in millions of dollars except as noted)

Item	1987	1988[1]	1989[2]	1990[2]	1991[3]	Percent Change 1987-88	Percent Change 1988-89	Percent Change 1989-90	Percent Change 1990-91
Industry Data									
Value of shipments[4]	24,109	25,737	28,369	30,067	—	6.8	10.2	6.0	—
Value of shipments (1987$)	24,109	24,832	25,727	26,442	26,839	3.0	3.6	2.8	1.5
Total employment (000)	122	121	127	125	—	-0.8	5.0	-1.6	—
Production workers (000)	100	100	106	104	—	0.0	6.0	-1.9	—
Average hourly earnings ($)	9.04	9.44	—	—	—	4.4	—	—	—
Capital expenditures	672	670	—	—	—	-0.3	—	—	—
Product Data									
Value of shipments[5]	23,245	24,602	27,245	28,850	—	5.8	10.7	5.9	—
Value of shipments (1987$)	23,245	23,735	24,712	25,413	25,794	2.1	4.1	2.8	1.5

[1] Advance data from the 1988 Annual Survey of Manufactures.

[2] Estimate.

[3] Forecast.

[4] Value of all products and services sold by establishments in the canned foods industry.

[5] Value of products classified in the canned foods industry produced by all industries.

SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA). Estimates and forecasts by ITA.

cent to $30.1 billion in 1990. In constant dollars, shipments increased 2.8 percent. The only sectors with significant real growth in the past few years were baby food, tomato products and other sauces, salad dressings, dried soups, assorted canned ethnic foods, and asceptically packaged foods. (Asceptic packages are multilayered, sterile, airtight paper and foil or plastic and foil food packages. They are often called "boxes." For more information on asceptic packaging, see chapter 10, Paper and Allied Products.) Based on the *1987 Census of Manufactures*, the number of canned specialties establishments grew 6.5 percent between 1982 and 1987 to 211 establishments, while the number of basic canned fruits and vegetables establishments declined 9.5 percent to 647.

Salad dressing shipments grew 3 percent in 1990, as the number of salad bars increased in both restaurants and supermarkets. Half of all supermarkets now provide salad bars.

Baby food sales volume has increased almost 12 percent in the past three years. This rise is partly due to the introduction of new products low in salt and with no sugar added, and with quart-sized contained baby juices.

Sales of dried and ready-to-serve soups continue to be strong. These products have more than doubled their market share over the last 10 years, and now account for almost one-third of the total soup market. Since they are easily microwaved, these products meet the needs of people who have little time for meal preparation.

Asceptically packaged boxed juices, now the norm for consumption by children, have continued to sell well since their introduction in 1977. Boxed juices have helped reverse the downward trend in per capita consumption that has plagued the canned juice industry since the mid-1970s.

International Trade

In 1990, U.S. exports of canned goods rose 16 percent to $1.9 billion, as exports of canned vegetables, noncitrus juices and tomato products increased 20 to 40 percent. As shown in Table 12, seven-eighths of all U.S. exports of canned goods fell into five categories: fruit juices (34 percent), dried fruits (26 percent), canned vegetables (13 percent), salad dressings and sauces (9 percent), and tomato products (5 percent).

Table 12: Major U.S. Canned Goods Exports and Destinations, 1990

Product	Percentage of U.S. Exports	Major Country Destination and Its Percentage Share	
Fruit juices	34	Canada	32
		Japan	32
Dried fruit	26	Japan	16
		United Kingdom	14
		Canada	13
		West Germany	13
		Italy	6
Vegetables	13	Japan	29
		United Kingdom	9
		West Germany	8
		Taiwan	7
		Canada	7
Salad preparations	9	Canada	30
		Saudi Arabia	13
		Mexico	8
		Japan	7
Tomato products	5	Canada	43
		United Kingdom	12
		Japan	9
		Hong Kong	7

SOURCE: U.S. Department of Commerce, International Trade Administration.

Japan and Canada continued to be the major export markets for U.S. canned goods. In 1990, as shown in Table 13, exports to Japan accounted for 23 percent of total U.S. exports of canned goods, and Canada accounted for 20 percent. The United Kingdom, West Germany, and Mexico accounted for another 17 percent.

Table 13: Top Five U.S. Export Markets for Canned Goods, 1990

Country	Percentage of U.S. Exports	Major Export and Percentage Share	
Japan	23	Fruit juices	26
		Dried fruit	18
		Vegetables	16
		Dried potatoes	9
		Citrus juices	7
Canada	20	Fruit juices	22
		Dried vegetables	14
		Salad preparations	13
		Fruit	12
United Kingdom	7	Dried fruit	52
		Dried Vegetables	15
		Vegetables	15
		Tomato products	9
West Germany	6	Dried fruit	54
		Vegetables	16
		Dried vegetables	12
		Fruit	8
Mexico	4	Dried vegetables	19
		Vegetables	19
		Dried fruit	18
		Salad preparations	15
		Fruit	11
		Canned specialties	10
		Tomato products	7

SOURCE: U.S. Department of Commerce, International Trade Administration.

During the first six months of 1990, U.S. exports of fruit juices to Canada were 38 percent above the same period in 1989. Exports of salad preparations increased 26 percent, canned fruit increased 10 percent, dried vegetables declined 7.5 percent.

U.S. exports of the major canned goods to Japan fluctuated during the first six months of 1990 compared to year earlier. While dried potatoes, noncitrus juices, and canned vegetables showed positive gains, 66 percent, 44 percent, and 11 percent, respectively, exports of canned fruits were down 18 percent. Citrus juice exports were flat.

U.S. imports of canned goods fell 8.6 percent in 1990 to $1.5 billion, as canned juice imports fell over 30 percent due to declines in shipments from West Germany, Hungary, and Brazil. Six products accounted for 62 percent of all canned imports: fruit juices, 20 percent; pineapples, 10 percent; tomato products and olives, 9 percent; mushrooms, 8 percent; and dried fruits, 6 percent as shown in Table 14.

In 1990, three countries supplied more than one-third of U.S. imports of canned goods: Spain, 15 percent; Mexico, 11 percent; and Thailand, 10 percent. Three other countries, the Philippines, Taiwan, and Japan, accounted for another 15 percent, as shown in Table 15.

Frozen Food

In 1990, the estimated current-dollar value of frozen food industry shipments rose 5.5 percent to $14.0 billion.

Table 14: Major U.S. Imports of Canned Goods, and Suppliers, 1990

Product	Percentage Share of U.S. Imports	Major Suppliers and Percentage Share	
Fruit juices	20	Argentina	19
		Mexico	16
		Austria	9
Pineapples	10	Thailand	49
		Philippines	34
		Japan	8
Tomato products	9	Chile	35
		Mexico	30
		Italy	5
Olives	9	Spain	89
		Greece	5
Mushrooms	8	Taiwan	31
		Indonesia	20
		Hong Kong	17
		Spain	9
Dried fruit	6	Turkey	37
		Pakistan	15
		Chile	10

SOURCE: U.S. Department of Commerce, International Trade Administration.

Table 15: Major U.S. Suppliers of Canned Goods, 1990

Country	Percentage Share of U.S. Imports	Product and Percentage of Total Exports to the U.S.	
Spain	15	Olives	49
Mexico	11	Citrus juices	25
		Tomato products	22
Thailand	10	Pineapples	53
Taiwan	5	Mushrooms	53
Philippines	5	Pineapples	73
		Pineapple juice	14
Japan	5	Pineapples	17
		Pineapple juice	11
		Soy sauce	9
		Bean cake	8

SOURCE: U.S. Department of Commerce, International Trade Administration.

Adjusted for price changes, industry shipments increased less than 1 percent. Because the industry is maturing, total frozen specialties (SIC 2038) grew only 3 percent a year in constant dollars during the past three years. Certain sectors, however, have shown heftier growth rates of 5 to 20 percent. These sectors include frozen breakfast items (waffles and French toast), ethnic foods, and low-calorie items.

The demand for frozen convenience foods has been keeping pace with the increase in single-parent households, two-income families, and women in the work force. Frozen ethnic foods and breakfast items appeal especially to families tha want variety but have limited time for meal preparation Frozen food manufacturers have also benefitted from the increased use of microwave ovens; in U.S. households, microwaves have jumped from 10 percent in 1976 to 72 percent in 1990. As a result, frozen breakfast items have been successfully competing with the breakfasts in fast food restaurants.

International Trade

U.S. exports of frozen food increased 16 percent in 1990 to $554 million. Although exports of frozen potatoes and frozen citrus juices each grew a modest 6 percent, frozen fruits and vegetables grew 35 percent and 15 percent, respectively. Exports of U.S. frozen fruits to Japan doubled during the first six months of 1990.

Three product categories accounted for almost five-sixths of U.S. frozen food exports: frozen citrus juice, 36 percent; frozen vegetables, 24 percent; and frozen French fries, 21 percent as shown in Table 16.

Table 16: Major U.S. Frozen Food Exports and Destinations, 1990

Product	Percentage Share of U.S. Exports	Major Country Destination and Percentage Share	
Citrus juice	36	Canada	42
		Japan	15
		France	10
French fries	21	Japan	55
		Canada	21
Vegetables	24	Japan	47
		Canada	15
		Hong Kong	5
		United Kingdom	4

SOURCE: U.S. Department of Commerce, International Trade Administration.

Japan is the largest market for all U.S. frozen food exports, absorbing 39 percent, followed by Canada with 27 percent. Hong Kong, France, and Taiwan absorb another 10 percent, as shown in Table 17.

In 1990, U.S. imports of frozen foods rose almost 65 percent to $1.1 billion. This was due mainly to the doubling of frozen orange juice concentrate (FOJC) imports, as Brazil, the major supplier to the United States, recovered from its 1989 freeze. Imports from Mexico of frozen broccoli and cauliflower have continued to increase. Citrus juices, including FOJC, are the largest imported item,

Trends and Forecasts: Frozen Foods (SIC 2037–8)

(in millions of dollars except as noted)

Item	1987	1988[1]	1989[2]	1990[2]	1991[3]	Percent Change 1987–88	1988–89	1989–90	1990–91
Industry Data									
Value of shipments[4]	12,223	12,638	13,304	14,036	—	3.4	5.3	5.5	—
Value of shipments (1987$)	12,223	12,095	12,431	12,492	12,865	−1.0	2.8	0.5	3.0
Total employment (000)	87.3	86.5	89.3	93.5	—	−0.9	3.2	4.7	—
Production workers (000)	72.9	71.8	74.2	77.6	—	−1.5	3.3	4.6	—
Average hourly earnings ($)	7.68	7.60	—	—	—	−1.0	—	—	—
Capital expenditures	353	412	—	—	—	16.7	—	—	—
Product Data									
Value of shipments[5]	11,498	12,410	13,155	13,955	—	7.9	6.0	6.1	—
Value of shipments (1987$)	11,498	11,884	12,259	12,388	12,760	3.4	3.2	1.1	3.0

[1] Advance data from the 1988 Annual Survey of Manufactures.

[2] Estimate.

[3] Forecast.

[4] Value of all products and services sold by establishments in the frozen foods industry.

[5] Value of products classified in the frozen foods industry produced by all industries.

SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA). Estimates and forecasts by ITA.

Table 17: Top Five U.S. Export Markets for Frozen Foods, 1990

Country	Percentage Share of U.S. Exports	Major Export and Percentage Share	
Japan	39	French fries	41
		Vegetables	29
		Citrus juices	15
Canada	27	Citrus juices	52
		Potato products	23
		Vegetables	13
Hong Kong	4	French fries	32
		Vegetables	30
		Citrus juices	28
France	4	Citrus juices	96
Taiwan	2	Citrus juices	45
		French fries	31
		Vegetables	24

SOURCE: U.S. Department of Commerce, International Trade Administration.

accounting for 53 percent of the total. Frozen broccoli followed at 11 percent, strawberries at 18 percent, and potatoes at 6 percent, as shown in Table 18.

Brazil and Mexico are the major sources of frozen foods imported into the U.S.—54 percent and 21 percent, respectively. Canada, Thailand, and Belize accounted for another 11 percent, as shown in Table 19. Mexico accounted for 96 percent of frozen broccoli imports and 87 percent of frozen strawberry imports. Canada accounted for 97 percent of frozen potato imports.

Outlook for 1991

Both the canned goods and frozen food industries will grow at a slower rate in 1991 than in 1990, partly due to the fact that total farm acreage contracted for processed fruits and vegetables will increase only slightly. In 1991, constant-dollar shipments of the canned goods industry are expected to increase a modest 1.5 percent; the frozen food industry is expected to increase 3 percent. Consumers prefer fresh, frozen, and frozen convenience foods which stress nutrition over basic canned fruits and vegetables. Most of the increase from the canned sector will come from a limited number of product categories: canned baby food, dried soups, sauces and dressings, asceptically packaged juices, and canned ethnic foods. Most of the increase in the frozen sector will come from frozen ethnic foods and breakfast items.

Long-Term Prospects

During the next 5 years, the value of shipments of the processed fruit, vegetable, and specialty industry is expected to increase at a compound annual rate of 1.2 to 2.5 percent, adjusted for price changes. This prediction is based on industry maturation and minor variations in farm acreage contracted for processed fruits and vegetables. Microwaveable convenience foods aimed at nutrition-minded consumers will continue to grow during this period. Many major food companies say that by 1995, 80 to 85 percent of their products will be mircowaveable. The sales of salad dressings and asceptically packaged juices will start to slow, while frozen breakfast items, low-calorie and ethnic frozen dinners and other microwaveable convenience foods will continue to grow.

Table 18: Major U.S. Imports of Frozen Foods, and Suppliers, 1990

Product	Percentage of U.S. Frozen Foods Imports	Major Supplier and Percentage Share	
Citrus juices	53	Brazil	82
		Mexico	12
		Belize	3
Broccoli	11	Mexico	96
		Guatemala	3
Strawberries	8	Mexico	87
		Guatemala	5
		Poland	4
Potato products	6	Canada	97

SOURCE: U.S. Department of Commerce, International Trade Administration.

Table 19: Major U.S. Suppliers of Frozen Foods to the U.S., 1990

Country	Percentage of U.S. Frozen Foods Imports	Product and Percentage of Total Frozen Foods Exports to the U.S.	
Brazil	54	Orange juice	99
Mexico	21	Broccoli	71
		Strawberries	16
Canada	7	Potato products	43
		Blueberries	20
Thailand	2	Pineapple juice	92
Belize	2	Orange juice	85
		Grapefruit juice	15

SOURCE: U.S. Department of Commerce, International Trade Administration.

The boxed juice market for children is maturing. To encourage growth in this sector, the industry will try to entice adults by producing asceptically-packaged juices in adult-sized containers—350ml rather than the 250ml size that is now popular. However, solid waste disposal problems may hamper any growth prospects, since the packages do not decompose easily. Since September 1990, Maine has prohibited the sales of asceptic packaging; and other states may follow suit.

While the U.S. market for basic canned fruits and vegetables will remain sluggish, the canned fruit and vegetable industry will find new markets overseas.

In spite of the current shake-out in the crowded frozen dinner category, with retailers eliminating many unprofitable lines, the frozen entree category will continue to grow modestly for a variety of reasons. First, the number of homes having microwave ovens will steadily increase; by 1995, 75 to 80 percent of all homes will have microwaves. Second, almost two-thirds of households will have only one or two persons, and two-thirds of all women will be in the work force and need meals that are quick and easy to prepare. Finally, children are playing a more important role in food shopping and meal planning. They prefer "on-the-run" meals to formal sit-down meals, and convenience foods fit the bill.

Although frozen meals will be a dominant force in the supermarket during the next five years, fresh refrigerated meals will take some market share from frozen entrees. By 1995, refrigerated meals will account for 15 percent of the market, compared to 5 percent in 1990.

Just as food companies stressed "low-calorie" in the 1980s, they will stress "nutrition" in the 1990s. Since the proportion of people 65 or older will be increasing more than twice as fast as the total population, frozen food processors will produce more convenient and nutritionally-balanced entrees for this group.

The processed fruit, vegetable, and specialty industry will also experience growth internationally. Companies will increase exports, and will also increase joint ventures, licensing agreements, and other direct investments as they continue their efforts to obtain better access to important overseas markets, including the European Community, Japan, and Mexico.—*Donald A. Hodgen, Office of Consumer Goods, (202) 377-3346, October 1990.*

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DAIRY PRODUCTS

Product shipments of the U.S. dairy industry (SIC 202) totaled $48.5 billion in 1990, reflecting no change from 1989 when adjusted for inflation. The dairy industry consists of 1,745 firms engaged in the manufacture of butter (SIC 2021); cheese (SIC 2022); condensed and evaporated milk products, including infant formula and ice cream mixes (SIC 2023); ice cream and frozen desserts (SIC 2024); and fluid milk, including cottage cheese and yogurt (SIC 2026).

Milk prices increased in 1990, for the second straight year, due to the 1989 drought and the cheese sector's vigorous bidding for milk. Though prices of inputs other than milk rose less rapidly, overall producer and retail prices in the dairy products industry increased in 1990.

Demand for dairy products showed significant variation in 1990, ranging from a 6.4 percent gain in cheese shipments over 1989 to a 25.1 percent loss for butter as measured in constant dollars. Propelled by Italian varieties, the cheese sector proved robust. Except for hard frozen yogurt, growth slowed in most categories of the ice cream and frozen dessert sector. Substantial gains for lowfat milk, skim milk, and yogurt helped the fluid milk segment, while cottage cheese lost ground. Rising sales of infant formula partially compensated for sluggish sales of nonfat dry milk, evaporated milk, and other products of the evaporated and condensed milk sector, as shown in Table 20.

Table 20: Per Capita Consumption of Butter, Nonfat Dry Milk, and Evaporated Milk

(in pounds and kilograms[1] per person)

Product	1987	1988	1989[2]	1990[2]	1991[3]
Butter	3.82 **1.73**	3.18 **1.44**	2.68 **1.22**	2.64 **1.20**	2.63 **1.19**
Nonfat dry milk	1.98 **0.90**	2.43 **1.10**	3.24 **1.47**	3.43 **1.56**	2.95 **1.34**
Evaporated milk	1.65 **0.75**	2.06 **0.93**	1.71 **0.78**	1.64 **0.74**	1.64 **0.74**

[1] Kilograms appear in boldface under the figures for pounds.
[2] Estimate by U.S. Department of Commerce, International Trade Administration (ITA).
[3] Forecast by ITA.

SOURCE: U.S. Department of Agriculture: Economic Research Service and National Agricultural Statistics Service.

Dairy processors faced numerous challenges in 1990. Reports of milk contaminated by animal antibiotics circulated widely, but these incidents did not curtail demand for lowfat milk. In response to this potential safety issue, the Food and Drug Administration (FDA) extensively sampled the milk for purity. In response to consumer concern about cholesterol in dairy products, the industry continued its research into technologies that may offer the potential to extract cholesterol from fluid milk. In trade, the value of dairy exports shrank 7.6 percent, while imports jumped 22.1 percent. Both foreign investment flows and the stock of foreign investment in the United States dairy industry exceeded the 1988 value of these indicators for U.S. companies overseas.

Prices

Continuing the price rise that began in 1989, prices of both fluid and manufacturing grade milk rose again in 1990, as shown in Table 21. Prices of other inputs changed at various rates. Of 10 indexes for the prices of common ingredients, 6 increased in 1990. Two others, butter and chocolate, showed substantial estimated price declines due to excess supply. For 8 categories of packaging, only 3 recorded gains, with noticeable estimated drops in the price of plastic resins and wrapping. The estimated rates of increase for energy and wages also diminished in 1990.

Higher production costs in 1990 translated into increased producer and consumer prices. The 1990 producer price index for all dairy products rose an estimated 10.3 percent over 1989. Performance in the 19 categories which comprise this series varied widely, ranging from a 21 percent rise for condensed and evaporated milk to a 19.4 percent decline for butter.

Increases in producer prices were reflected in higher consumer prices in 1990, as shown in Table 22. Retail prices for all dairy products increased 10.7 percent. Processed dairy goods gained 9.5 percent, fresh milk and cream gained 11.9 percent, and non-dairy substitutes rose 4.6 percent. Stable to lower soybean prices contributed to the moderate increases of non-dairy product substitutes and margarine.

Trends and Forecasts: Dairy Products (SIC 202)

(in millions of dollars except as noted)

Item	1987	1988[1]	1989[2]	1990[2]	1991[3]	Percent Change 1987–88	Percent Change 1988–89	Percent Change 1989–90	Percent Change 1990–91
Industry Data									
Value of shipments[4]	44,730	46,944	49,387	55,347	59,258	4.9	5.2	12.1	7.1
2021 Creamery butter	1,420	1,765	1,790	1,475	1,344	24.3	1.4	−17.6	−8.9
2022 Cheese products	12,948	13,135	14,268	16,961	18,547	1.4	8.6	18.9	9.4
2023 Dry/condensed products	5,857	6,245	6,511	7,309	7,617	6.6	4.3	12.3	4.2
2024 Ice cream	3,915	4,297	4,323	4,648	4,934	9.8	0.6	7.5	6.2
2026 Fluid milk	20,591	21,502	22,495	24,954	26,816	4.4	4.6	10.9	7.5
Value of shipments (1987$)	44,730	46,631	45,977	46,093	45,466	4.3	−1.4	0.3	−1.4
2021 Creamery butter	1,420	1,846	1,772	1,328	1,134	30.0	−4.0	−25.1	−14.6
2022 Cheese products	12,948	13,161	13,435	14,289	14,344	1.6	2.1	6.4	0.4
2023 Dry/condensed products	5,857	6,179	6,001	5,991	5,740	5.5	−2.9	−0.2	−4.2
2024 Ice cream	3,915	4,306	4,036	3,896	3,840	10.0	−6.3	−3.5	−1.4
2026 Fluid milk	20,591	21,143	20,733	20,589	20,408	2.7	−1.9	−0.7	−0.9
Total employment (000)	141	143	141	139	139	1.4	−1.4	−1.4	0.0
2021 Creamery butter	1.7	1.9	1.9	1.8	1.7	11.8	0.0	−5.3	−5.6
2022 Cheese products	33.0	33.8	34.0	33.7	33.9	2.4	0.6	−0.9	0.6
2023 Dry/condensed products	14.1	13.0	12.7	12.6	12.5	−7.8	−2.3	−0.8	−0.8
2024 Ice cream	20.3	21.2	21.0	20.8	20.7	4.4	−0.9	−1.0	−0.5
2026 Fluid milk	72.4	73.0	71.1	70.4	70.0	0.8	−2.6	−1.0	−0.6
Production workers (000)	87.0	90.1	90.7	89.0	88.6	3.6	0.7	−1.9	−0.4
2021 Creamery butter	1.3	1.5	1.5	1.4	1.3	15.4	0.0	−6.7	−7.1
2022 Cheese products	27.0	28.1	28.4	28.3	28.5	4.1	1.1	−0.4	0.7
2023 Dry/condensed products	8.7	9.3	10.1	9.8	9.6	6.9	8.6	−3.0	−2.0
2024 Ice cream	13.8	14.1	13.8	13.7	13.7	2.2	−2.1	−0.7	0.0
2026 Fluid milk	36.2	37.1	36.9	35.8	35.5	2.5	−0.5	−3.0	−0.8
Average hourly earnings ($)	10.32	10.49	10.97	11.28	—	1.6	4.6	2.8	—
2021 Creamery butter	9.79	10.66	11.02	11.40	—	8.9	3.4	3.4	—
2022 Cheese products	9.70	9.70	10.01	10.24	—	0.0	3.2	2.3	—
2023 Dry/condensed products	11.47	11.70	12.10	12.51	—	2.0	3.4	3.4	—
2024 Ice cream	9.99	9.89	10.22	10.57	—	−1.0	3.3	3.4	—
2026 Fluid milk	10.63	10.99	11.39	11.75	—	3.4	3.6	3.2	—
Capital expenditures	744	791	—	—	—	6.3	—	—	—
2021 Creamery butter	9.7	9.7	—	—	—	0.0	—	—	—
2022 Cheese products	146	135	—	—	—	−7.5	—	—	—
2023 Dry/condensed products	110	108	—	—	—	−1.8	—	—	—
2024 Ice cream	137	159	—	—	—	16.1	—	—	—
2026 Fluid milk	342	380	—	—	—	11.1	—	—	—
Product Data									
Value of shipments[5]	39,308	41,289	43,370	48,471	51,815	5.0	5.0	11.8	6.9
2021 Creamery butter	1,614	1,741	1,766	1,455	1,326	7.9	1.4	−17.6	−8.9
2022 Cheese products	10,776	10,849	11,785	14,009	15,319	0.7	8.6	18.9	9.4
2023 Dry/condensed products	5,839	6,176	6,439	7,228	7,533	5.8	4.3	12.3	4.2
2024 Ice cream	4,195	4,574	4,602	4,948	5,252	9.0	0.6	7.5	6.1
2026 Fluid milk	16,885	17,949	18,778	20,831	22,385	6.3	4.6	10.9	7.5
Value of shipments (1987$)	39,308	41,069	40,386	40,388	39,782	4.5	−1.7	0.0	−1.5
2021 Creamery butter	1,614	1,827	1,754	1,313	1,122	13.2	−4.0	−25.1	−14.5
2022 Cheese products	10,776	10,752	10,973	11,674	11,721	−0.2	2.1	6.4	0.4
2023 Dry/condensed products	5,839	6,060	5,886	5,876	5,630	3.8	−2.9	−0.2	−4.2
2024 Ice cream	4,195	4,588	4,273	4,151	4,090	9.4	−6.9	−2.9	−1.5
2026 Fluid milk	16,885	17,842	17,500	17,374	17,219	5.7	−1.9	−0.7	−0.9

[1] Advance data from the 1988 Annual Survey of Manufactures.

[2] Estimate.

[3] Forecast.

[4] Value of all products and services sold by establishments in the dairy products industry.

[5] Value of products classified in the dairy products industry produced by all industries.

SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA). Estimates and forecasts by ITA.

Cheese

Total value of product shipments of cheese produced in the United States increased an estimated 18.9 percent, ranging from a 24 percent boost for natural cheeses to no change for cheese substitutes, as shown in Table 23. Italian types led the three groups of natural cheeses, with an estimated 9.1 percent increase in per capita consumption, as shown in Table 24. Mozzarella—a pizza ingredient and popular in stick form as a snack—increased 12.3 percent. Ricotta, a favorite of the restaurant trade and manufacturers of frozen entrees, maintained its 1989 growth of 1.3 percent. Consumption of cream cheese rose 15 percent, pushed up by the 10.5 percent increase in demand for bagels. After losing ground in 1988, per capita consumption of American cheese increased 7 percent in 1990.

Patterns of processed cheese consumption differed significantly from those of natural types, with estimated 1990 per capita consumption of processed cheese declining 3.7 percent from 1989. Three elements contributed to this decline. First, the food service industry, which purchases an estimated 40 percent of all cheese, has introduced fewer new entrees with processed cheese. This business, which operates on wider margins than food manufacturing, increased its purchases of natural cheese, especially Italian types. Second, food manufacturers, which bought an estimated 20 percent of all cheese, often have replaced processed cheese with natural cheese in their recipes to accommodate consumer preferences and because the spread between prices of natural and processed cheese has narrowed considerably. Finally, as per capita consumption of red meat declines, both consumers and food

Table 21: Price Changes of Dairy Inputs

(in percentages)

Item	1987	1988	1989	1990[1]
Ingredients				
Manufacturing grade milk	0.2	−2.0	11.0	12.2
Milk eligible for fluid use	1.3	−2.8	10.4	11.2
Skim milk	7.1	1.1	7.5	11.2
Condensed and evaporated milk	4.3	−0.6	14.1	15.6
Butter	−3.1	−4.7	−3.1	−19.4
Sugar	3.7	2.1	7.1	13.8
Corn sweeteners	−4.7	2.4	21.4	4.1
100% vegetable shortening	1.5	27.4	−8.8	N.A.[2]
Chocolate	−0.3	−3.2	−5.5	5.7
Dehydrated and dried fruits and nuts	3.4	4.3	3.9	7.1
Packaging				
Paperboard milk cartons	0.4	2.6	5.6	6.0
Plastic wrapping	1.9	9.3	2.7	−3.0
Plastic resins	6.7	22.6	0.4	−12.8
Laminated paper	3.3	6.8	6.2	2.8
Paperboard boxes	3.6	4.9	8.3	4.7
Labels	1.2	2.8	4.4	0.9
Glass containers	1.0	−0.6	2.6	4.6
Food cans[2]	0.7	2.0	0.2	3.5
Energy				
Natural gas	−11.3	−2.6	5.9	−2.2
Commercial electricity rates	−1.8	0.5	3.2	1.4
Diesel fuel	14.0	−10.3	18.5	12.3
Gasoline	7.5	−2.6	13.6	7.5
Wages	4.8	1.4	3.5	2.9

[1] Estimate by U.S. Department of Commerce, International Trade Administration

[2] N.A.=Not available

SOURCE: U.S. Department of Labor, Bureau of Labor Statistics

Table 22: Retail Prices of Dairy Products, 1987–90

Product	1987	1988	1989	1990[1]
Fresh whole milk ($/half gallon)	1.137	1.164	1.269	1.452
Fresh lowfat milk ($/half gallon)	1.062	1.113	1.175	N.A.
Grade AA salted butter ($/lb.)	2.170	2.158	2.133	2.008
Margarine, stick form ($/lb.)	0.691	0.734	0.821	0.833
Margarine, soft form ($/lb.)	0.974	1.043	1.174	1.199
Natural cheddar cheese ($/lb.)	3.056	3.165	3.219	N.A.
American processed cheese ($/lb.)	2.689	2.776	2.974	N.A.
Prepacked ice cream ($/half gallon)	2.460	2.460	2.600	2.631

[1] Estimate by U.S. Department of Commerce, International Trade Administration.

[2] Not available.

SOURCE: U.S. Department of Labor, Bureau of Labor Statistics.

Table 23: Product Shipments of Cheese

(in millions of dollars)

Type of Cheese	1987	1988	1989[1]	1990[1]	1991[2]
TOTAL	10,775.7	10,849.0	11,785.0	14,009.0	15,319.2
Natural cheese	6,414.5	6,528.0	7,208.5	8,937.1	9,827.9
Processed cheese and related products	3,480.1	3,541.7	3,730.3	4,094.8	4,446.3
Cheese substitute	294.9	300.1	311.5	311.9	313.5
Cheese not specified	586.2	479.2	534.7	665.2	731.5

[1] Estimate by U.S. Department of Commerce, International Trade Administration (ITA).

[2] Forecast by ITA.

SOURCE: U.S. Department of Commerce: Bureau of the Census and ITA.

service companies purchase less processed cheese to complement red meat dishes. Rising consumption of poultry and fish has not generally prompted consumers and food service firms to incorporate processed cheese into poultry and fish dishes.

Frozen Desserts

The estimated 1990 value of product shipments for ice cream and frozen desserts rose 7.5 percent over 1989. Results ranged from a 55.2 sales gain in hard frozen yogurt to a 30.7 percent drop for mellorine, a frozen dessert derived from vegetable fat, as shown in Table 25. Adjusted for inflation, the rate of growth of product shipments declined 3.5 percent.

Table 24: Per Capita Consumption of Various Cheeses

(in pounds and kilograms[1] of natural cheese equivalent)

Type of Product	1987	1988	1989	1990[2]	1991[3]
All natural cheeses	21.51	21.67	22.63	24.34	24.35
	9.75	**9.87**	**10.26**	**11.02**	**11.04**
American	10.75	10.23	10.76	11.51	11.06
	4.87	**4.64**	**4.88**	**5.22**	**5.01**
Cheddar	8.98	8.29	8.94	9.56	9.20
	4.07	**3.76**	**4.05**	**4.34**	**4.17**
Other American[4]	1.77	1.94	1.82	1.95	1.86
	0.80	**0.88**	**0.83**	**0.88**	**0.84**
Italian	7.37	7.86	8.23	8.98	9.32
	3.34	**3.61**	**3.74**	**4.06**	**4.23**
Mozzarella	5.59	5.98	6.41	7.20	7.52
	2.54	**2.71**	**2.91**	**3.26**	**3.41**
Ricotta	0.67	0.72	0.75	0.76	0.79
	0.30	**0.37**	**0.34**	**0.34**	**0.36**
Other Italian[5]	1.11	1.16	1.07	1.02	1.01
	0.50	**0.53**	**0.49**	**0.46**	**0.46**
Miscellaneous	3.39	3.58	3.64	3.85	3.97
	1.34	**1.62**	**1.64**	**1.74**	**1.80**
Swiss	0.93	1.02	0.95	1.04	1.00
	0.42	**0.46**	**0.43**	**0.47**	**0.45**
Cream	1.35	1.46	1.53	1.76	1.87
	0.61	**0.66**	**0.69**	**0.80**	**0.85**
Blue	0.15	0.15	0.14	0.14	0.14
	0.07	**0.07**	**0.06**	**0.06**	**0.06**
All other[6]	0.96	0.95	1.02	0.91	0.96
	0.44	**0.43**	**0.46**	**0.41**	**0.44**
(in pounds by processed weight form)[7]					
Total processed product	8.40	8.39	8.08	7.78	7.61
	3.81	**3.80**	**3.66**	**3.52**	**3.45**
Cheese	4.64	4.66	4.53	4.42	4.33
	2.10	**2.11**	**2.05**	**2.00**	**1.96**
Foods spread, and cold pack	3.76	3.73	3.55	3.36	3.28
	1.71	**1.69**	**1.61**	**1.52**	**1.49**

[1] Kilograms appear in boldface under the figures for pounds.

[2] Estimate by ITA.

[3] Forecast by ITA.

[4] Includes Colby, washed curd, stirred curd, and Monterey Jack.

[5] Includes Romano, Provolone, and Parmesan.

[6] Includes brick, Muenster, Edam, and Gouda.

[7] Processed cheese, cold pack, and cheese food contain natural cheese and other dairy products.

SOURCE: U.S. Department of Commerce, International Trade Administration (ITA); U.S. Department of Agriculture: Economic Research Service and National Agricultural Statistics Service.

Table 25: Product Shipments of Ice Cream and Frozen Desserts

(in millions of dollars)

Type of Product	1987	1988	1989[1]	1990[1]	1991[2]
TOTAL	4,195.0	4,574.0	4,602.0	4,948.0	5,252.0
All ice cream	3,269.5	3,519.0	3,481.7	3,704.9	3,902.9
Ice Cream, including custards	2,562.4	2,757.9	2,728.7	2,903.6	3,058.8
novelty forms	707.1	761.1	753.0	801.3	844.1
Ice milk	188.0	202.3	225.4	236.6	264.7
Sherbet	102.1	109.9	115.4	119.1	129.3
Frozen yogurt, manufactured in plants	104.5	112.5	133.5	207.2	236.2
Water ices	185.7	199.9	198.6	201.8	212.6
Mellorine and other desserts containing vegetable fat	11.7	12.6	8.8	6.1	6.6
Other frozen desserts, including frozen pudding pops	84.2	90.6	95.2	102.4	97.9
Unspecified items	249.0	327.2	343.4	369.9	401.8

[1] Estimate by ITA.

[2] Not available.

SOURCE: U.S. Department of Commerce: International Trade Administration (ITA) and Bureau of the Census.

Most types of frozen desserts experienced declines in per capita consumption in 1990. Of nine varieties of frozen desserts, estimated per capita consumption rose for only three—hard ice milk, hard frozen yogurt, and frozen yogurt mix. As many consumers switched to frozen desserts with less milkfat, consumption of ice cream dipped 0.6

Table 26: Per Capita Consumption of Ice Cream and Frozen Desserts

(in gallons and liters[1])

Type of Product	1987	1988	1989	1990[2]	1991[3]
Total ice cream	3.80 **14.38**	3.63 **13.74**	3.35 **12.68**	3.33 **12.60**	3.15 **11.92**
Hard	3.63 **13.74**	3.47 **13.14**	3.18 **12.04**	3.16 **11.96**	3.06 **11.58**
Soft	0.17 **0.64**	0.16 **0.60**	0.17 **0.64**	0.17 **0.64**	0.09 **0.34**
Total ice milk	1.34 **5.07**	1.44 **5.44**	1.51 **5.72**	1.47 **5.56**	1.48 **5.60**
Hard	0.30 **1.13**	0.39 **1.47**	0.48 **1.82**	0.50 **1.89**	0.52 **1.97**
Soft	1.04 **3.94**	1.05 **3.97**	1.03 **3.90**	0.97 **3.67**	0.96 **3.63**
Sherbet	0.20 **0.76**	0.21 **0.79**	0.21 **0.79**	0.20 **0.76**	0.19 **0.72**
Frozen yogurt, manufactured in plants	N.A.[4] **N.A.[4]**	N.A.[4] **N.A.[4]**	0.33 **1.25**	0.48 **1.82**	0.61 **2.31**
Frozen yogurt mix	N.A. **N.A.**	N.A. **N.A.**	0.22 **0.83**	0.32 **1.21**	0.46 **1.74**
Water ices	0.19 **0.72**	0.19 **0.72**	0.17 **0.64**	0.18 **0.68**	0.17 **0.64**
Other frozen desserts, including frozen pudding pops	0.15 **0.57**	0.16 **0.61**	0.13 **0.49**	0.17 **0.64**	0.17 **0.64**

[1] Liters appear in boldface under the figures for gallons.

[2] Estimate by ITA.

[3] Forecast by ITA.

[4] N.A.=Not available.

SOURCE: U.S. Department of Agriculture, National Agricultural Statistical Service; U.S. Department of Commerce, International Trade Administration (ITA).

percent. Per capita consumption of sherbet also decreased 4.8 percent because of competition from lowfat frozen yogurt. Total shipments of foreign desserts also declined, as shown in Table 26.

Frozen Yogurt

This dessert, which comes in both hard and soft textures, first entered the market in force in 1987, after a failed debut in the late 1970s. Many consumers prefer the product's lower caloric, fat, and cholesterol content. Originally, only franchised specialty shops dispensed soft frozen yogurt, a product blended on premise from a mix.

Between 1987 and 1989, the estimated number of retailers selling frozen yogurt more than tripled to 8,800 outlets. To fulfill the demand for frozen yogurt, many supermarkets have installed self-serve frozen yogurt machines. These machines can be more profitable than equipment served by store personnel, despite consumer waste and theft of the product. Estimated 1990 per capita consumption of both hard and soft frozen yogurt rose 45.4 percent. By 1989, large food companies, frequently relying on their well-known brand names, began to offer hard frozen yogurt to food retailers.

In 1990, the International Ice Cream Association petitioned the Food and Drug Administration (FDA) to create standards of identity for 4 types of ice cream: standard (10 percent or greater milkfat), reduced fat (2-7 percent milkfat), lowfat (0.5-2 percent milkfat), and nonfat (less than 0.5 percent milkfat). Simultaneously, the FDA began working to define frozen yogurt, many brands of which currently do not contain active yogurt cultures. These two modified definitions of ice cream and frozen yogurt could stimulate demand for both, since the changes could result in more products on the market and better consumer information.

In the battle to attract the attention of health-conscious consumers, yogurt has outperformed cottage cheese, a favorite in earlier years. In 1990, estimated value of shipments for yogurt, except frozen, jumped a significant 36.3 percent, and estimated per capita consumption of yogurt, except frozen, increased by 23.4 percent. Meanwhile, price increases pushed the estimated value of shipments of cottage cheese up 12.3 percent in 1990, although estimated per capita consumption of cottage cheese fell 4.6 percent, as shown in Table 27.

Table 27: Product Shipments of Yogurt, except Frozen, and Cottage Cheese

(in millions of dollars)

Item	1987	1988	1989[1]	1990[1]	1991[2]
Yogurt, except frozen	685.3	728.5	844.6	1,151.5	1,412.1
Cottage cheese	688.3	732.1	748.7	840.9	895.9

Estimate by ITA.

[2] Forecast by ITA.

SOURCE: U.S. Department of Commerce: International Trade Administration (ITA) and Bureau of the Census.

Fluid Milk

In 1990, estimated per capita consumption of whole milk dropped 1.4 percent, while lowfat and skim milk increased 2.7 percent and 2.3 percent, respectively, as shown in Table 28. Many consumers have abandoned whole milk for lowfat and skim milk because it is perceived as more healthful and is usually less expensive at retail than whole milk.

Dairy and nondairy baby formula have outpaced the rest of the evaporated and condensed milk sector. Rising values of product shipments for infant formula, shown in Table 29, partially offset slow growth elsewhere in the U.S. milk industry. Nondairy infant formula, derived primarily from soybeans, appeals to parents whose babies cannot digest dairy-based products. This category of infant formula represented 31.6 percent of total estimated 1990 value of product shipments.

Competition among infant formula suppliers intensified as two new companies entered this market. Their marketing strategy involves advertising directly to the consumer and not to doctors through medical journals, the traditional vehicle for reaching potential buyers. In response, some pediatricians, who fear a diminution of breast feeding, have argued for U.S. acceptance of the World Health Organization code on infant formula, which prohibits general advertising of the product.

Table 28: Per Capita Consumption of Selected Fluid Milk Products

(in pounds and kilograms[1])

Product	1987	1988	1989[2]	1990[2]	1991[3]
Fluid whole milk	118.57 **53.78**	115.21 **52.26**	113.57 **51.51**	111.95 **50.78**	110.35 **50.05**
Lowfat milk	89.00 **40.37**	91.44 **41.48**	93.94 **42.61**	96.52 **43.78**	99.16 **44.98**
Skim milk	10.99 **4.98**	11.24 **5.10**	11.49 **5.21**	11.76 **5.33**	12.03 **5.46**
Yogurt	N.A.[4] **N.A.[4]**	N.A.[4] **N.A.[4]**	3.68 **1.70**	4.54 **2.06**	4.71 **2.14**
Cottage Cheese	3.88 **1.76**	3.81 **1.73**	3.51 **1.59**	3.35 **1.52**	3.23 **1.47**
Lowfat	1.11 **0.50**	1.18 **0.54**	1.21 **0.55**	1.21 **0.55**	1.23 **0.56**
Creamed	2.77 **1.26**	2.63 **1.19**	2.30 **1.04**	2.14 **0.97**	2.00 **0.91**

[1] Kilograms appear in boldface under the figures for pounds.

[2] Estimate by U.S. Department of Commerce, International Trade Administration (ITA).

[3] Forecast by ITA.

[4] N.A.=Not Available.

SOURCE: U.S. Department of Agriculture: Agricultural Marketing Service and Economic Research Service.

Table 29: Product Shipment of Infant Formula

(in millions of dollars)

CATEGORIES	1987	1988	1989[1]	1990[1]	1991[2]
TOTAL	1172.4	1243.0	1316.0	1413.3	1528.8
Dairy-based	807.5	856.1	900.6	966.3	1044.5
dry	261.7	277.5	293.0	315.0	341.7
liquid	545.8	578.7	607.6	651.3	702.8
Non-dairy	364.9	386.9	415.4	447.0	484.3
dry	108.9	115.5	123.9	133.7	144.6
liquid	256.0	271.4	291.5	313.4	339.7

[1] Estimate by ITA.

[2] Forecast by ITA.

SOURCE: U.S. Department of Commerce: Bureau of the Census and International Trade Administration (ITA).

Tainted Milk

After some fluid milk contaminated with antibiotic residues from dairy cows reached the market in 1990, the Food and Drug Administration (FDA), which regulates dairy food safety, sampled milk in 14 cities. The FDA found traces of antibiotics at 1 to 3 parts per billion in 58 of 70 cases. According to FDA standards, 10 parts per billion may pose a health hazard. Despite media attention on this situation, sales of milk remained stable.

Cholesterol Removal

Researchers at Cornell University pioneered a technique for selectively removing cholesterol from milk without reducing its fat content. They applied supercritical fluid extraction, already commercially used to decaffeinate coffee, to remove from milk both cholesterol and fat. Food scientists then separated the cholesterol and either diverted the fat to the manufacture of other dairy products or returned it to the milk. This process, which has yet to be commercialized, recovers 85 percent of the non-cholesterol fat in milk.

Government Programs

The Federal Government operates three programs to bolster the farm price of milk: price supports for four products, marketing orders restricting the transport of milk, and quotas on dairy imports. These programs protect U.S. dairy farmers from price volatility, assure an adequate year-round supply of milk to the market, and create incentives for farmers to keep resources in dairying. Because there are no production quotas, the Government must purchase at a fixed price the following milk products: butter, canned milk, cheese, and nonfat dry milk. Fresh milk is excluded from this program due to its perishability.

In 1990, estimated Government purchases of dairy goods shrank 22.2 percent to 7 billion pounds; these purchases pushed up total inventory by 1.2 percent. With a 2.7 percent drop in butter production, purchases of butter declined 19 percent. The Government bought no cheese and only 2.3 million pounds of nonfat dry milk, much less than in prior years. Major concessionary (indirectly subsidized) export sales of butter, robust demand for cheese, and steady industrial demand for nonfat dry milk contributed to the decline in Government purchases in 1990.

International Trade and Investment

Total 1990 U.S. dairy exports fell 13.3 percent to an estimated $410.8 million. Results ranged from a 144.0 percent gain in butter exports to a significant 48.7 percent reduction in exports of evaporated and condensed milk. Reduced concessionary sales to Mexico explain much of the export decline for evaporated and condensed milk.

Table 30: 1990 Exports and Imports of Butter and Cheese for the Top Four Countries[1]

(in millions of dollars)[2]

Country	Butter	Value
	Exports	
TOTAL		$132.2
Soviet Union		67.9
Mexico		25.1
Jamaica		18.9
Romania		10.7
All others		9.6
	Imports	
TOTAL		$ 2.4
Belgium		0.5
New Zealand		0.4
Denmark		0.4
Japan		0.4
All others		1.0
	Cheese	
	Exports	
TOTAL		$ 36.2
Canada		8.6
Japan		6.6
Iraq		5.7
Mexico		2.9
All others		12.4
	Imports	
TOTAL		$512.4
Italy		77.1
Denmark		55.2
France		48.9
New Zealand		38.7
All others		292.5

[1] These classifications reflect a concordance of export and import codes under the Harmonized System. Therefore, these data are not directly comparable to numbers before 1989.

[2] Estimate by ITA.

SOURCE: U.S. Department of Commerce: Bureau of the Census, and International Trade Administration (ITA).

In 1990, total dairy product imports increased by 22.1 percent to an estimated $904 million. Changes ranged from a 34.4 percent increase for cheese to a 98.1 percent drop in fluid milk products. Italy and Denmark were the leading suppliers of cheese. Imports and exports are shown in Tables 30, 31, and 32.

Both inward and outward foreign investments have increased substantially in the last several years. In 1989, capital inflows to the U.S. dairy industry from abroad reached $275 million, representing a total investment of $977 million since 1985. Much of the foreign investment entered the cheese sector, as Western European firms expanded their U.S. production of soft cheeses such as Brie and Camembert. Meanwhile, U.S. companies sent $139 million overseas for a total foreign investment position of $923 million, up from $686 million in 1985.

Outlook for 1991

In constant dollars, the total value of U.S. dairy product shipments is expected to decrease an estimated 1.5 percent. Performance should range from a 0.4 percent rise in shipments for cheese to a 14.5 percent decline for butter.

Most dairy input prices should rise slightly in 1991, although prices of raw fluid milk may be unexpectedly down at least 8 percent. Sustained increases in energy prices will raise

Table 31: 1990 Exports and Imports of Evaporated and Condensed Milk (including Infant Formula) and Ice Cream and Frozen Desserts for the Top Four Countries[1]

(in millions of dollars)[2]

Country	Evaporated and Condensed Milk (including Infant Formula)	Value
	Exports	
TOTAL		$181.5
India		30.7
Mexico		18.7
Japan		18.2
Canada		11.0
All others		102.9
	Imports	
TOTAL		$389.0
Ireland		184.8
New Zealand		105.2
France		39.2
Australia		13.7
All others		46.1
	Ice Cream and Frozen Desserts	
	Exports	
TOTAL		$ 14.2
Canada		2.6
Japan		2.1
Mexico		1.9
Bermuda		1.9
United Kingdom		1.6
All others		4.1
	Imports	
TOTAL		$ 0.0

[1] These classifications reflect a concordance of export and import codes under the Harmonized System. Therefore, these data are not directly comparable to numbers before 1989.

[2] Estimate by ITA.

SOURCE: U.S. Department of Commerce: Bureau of the Census and International Trade Administration (ITA).

production and distribution costs. Transportation costs are particularly important to the fluid milk industry because bottlers often collect raw milk from farmers and haul the finished product to retailers. Sixteen percent of the fluid milk sector's employees are engaged in transportation.

Per capita consumption of all cheese should remain unchanged in 1991, although Italian varieties could gain by 3.8 percent. More domestic and foreign enterprises are expected to enter the soft, ripened cheese segment. Companies will likely experiment with new packaging configurations in search of greater market share.

Table 32: 1990 Exports and Imports of Fluid Milk for the Top Four Countries[1]

(in millions of dollars)[2]

Country		Value
	Exports	
TOTAL		$46.4
Mexico		19.5
France		18.0
Bahamas		2.2
Taiwan		0.9
All others		5.8
	Imports	
TOTAL		$ 0.2
Netherlands		0.1
All others		0.1

[1] These classifications reflect a concordance of export and import codes under the Harmonized System. Therefore, these data are not directly comparable to numbers prior to 1989.

[2] Estimate by ITA.

SOURCE: U.S. Department of Commerce: Bureau of the Census and International Trade Administration (ITA).

The industry's ice cream and frozen desserts sector could suffer further erosion of consumer demand, particularly for premium ice cream, as frozen yogurt continues to gain in popularity. The expected approval by the FDA of the four proposed new categories of ice cream may, however, partially offset the decline in demand for ice cream.

In the fluid milk category, collective per capita consumption of lowfat milk, skim milk, and yogurt is anticipated to rise 2.7 percent, but cottage cheese consumption should continue to drop.

In the condensed and evaporated milk sector, infant formula shipments are estimated to rise 8.2 percent. Public debate concerning the regulation of infant formula marketing will intensify among pediatricians. In this sector, nonfat dry milk should lose ground to nondairy substitutes.

In reaction to the fear of possible contamination of dairy products, processors will redouble their prevention efforts. Research will continue on removing cholesterol from dairy products, and food scientists will focus closely on supercritical fluid extraction, an existing technology which has significant potential benefits.

The 1991 trade and investment outlook for the dairy industry is mixed. Total dairy exports are expected to recover, rising 17.2 percent. Foreign demand for U.S. cheese, ice cream, and frozen desserts will rise considerably, stimulated in part by lower Japanese tariffs on cheese and ice cream in 1991. Imports will rise by 13.4 percent, with an expected 20 percent jump in cheese imports. As domestic dairy prices increase for the third consecutive year, imports of casein—an important milk protein used in imitation and substitute dairy products—should expand in 1991. No import quota exists for casein. Foreign investment in the U.S. dairy industry should increase by at least $100 million, while U.S. investment abroad is not expected to increase as much in 1991.

Long-Term Prospects

Between 1991 and 1996, total constant dollar shipments are anticipated to grow 1 percent a year, which will exceed the 0.7 percent rate of increase forecast for the U.S. population.

Led by demand for Italian types of cheese, the cheese sector should experience a 1.5 percent annual rise, assisted by changing demographic and taste trends. The set of consumers aged 35 to 54 years will grow 2.9 percent yearly from 1991 to 1996, and data in the 1980–88 *Consumer Expenditure Surveys* by the Bureau of Labor Statistics reveal that this age group consistently spends more on cheese for consumption at home than other groups.

The popularity of premium ice cream should continue to decline over the next 5 years. This trend should lead manufacturers of ice cream and frozen deserts to introduce a variety of low-calorie products—adhering to FDA standards of identity—which will generate a 1.3 percent annual growth. Helped by sales of infant formula and ice cream mixes, the dairy industry's condensed and evaporated milk segment is anticipated to gain 1.1 percent a year. For the fluid milk sector, sales of yogurt, reduced fat milk, and cottage cheese should assure continuation of the sector's 1 percent annual growth. The real value of butter shipments is expected to decline by 5 percent a year.

Technical Innovations

Six trends should characterize future dairy technology, three involving milk production on dairy farms.

First, on-farm ultrafiltration of raw milk may revolutionize dairy processing and farming by allowing dairy farmers to separate milk into higher value-added components customized for the exact needs of processors. This approach lends itself to component pricing of milk, with payment to the farmer based on the yield of various dairy foods derived from a shipment of milk. Second, many dairy farmers will rely on computers to handle accounting and marketing chores and to adjust the mix of cattle feed rations in response to volatile grain prices.

Third, genetically-engineered bovine growth hormones are likely to win final FDA approval in 1991. Such hormones could increase milk production at least 10 percent, but farmer and consumer opposition may limit widespread adoption of this technology. Some consumers are concerned about the safety of the hormone, and smaller dairy farmers tend to oppose it because it would create excess supplies of milk and thus bring prices down.

The remaining three innovations would benefit dairy processors. Sensors immersed in a truckload of milk may detect minute quantities of animal drug residues and other potential contaminants before the milk enters the production stream. This new procedure would provide more accurate results than conventional laboratory testing. Also, commercialization of a cholesterol extraction system would permit creation of many new dairy products. Finally, the U.S. cheese sector may receive help in disposing of whey, which in the past has clogged streams, killed fish, and encouraged the growth of algae, when disposed of in water supplies. Researchers at Ohio State University are exploring a chemical procedure to convert whey to calcium magnesium acetate, an inert substance for melting ice and snow. Preliminary results indicate that calcium magnesium acetate would sell for $20 to $40 per ton, while conventional rock salt is priced at $500 a ton. Scientists also claim that calcium magnesium acetate would not contribute to the rusting of vehicles, a benefit of enormous consequence.—*William V. Janis, Office of Consumer Goods, (202) 377-2250, October 1990.*

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CEREAL BREAKFAST FOODS

The cereal breakfast food industry (SIC 2043) manufactures ready-to-eat (cold) and hot cereals. In 1990, the estimated value of product shipments decreased 1 percent, adjusted for inflation.

Per capita consumption dipped an estimated 2.5 percent in 1990, in response to a large 1989 retail price increase of 9.2 percent. Changing preferences, demographics, and spending patterns influence consumption trends; the trend in 1990 was slower growth than the 2.4 percent the industry experienced each year between 1985 and 1989.

Companies benefitted in 1990 from a slight decline in weighted average ingredient costs. Consequently, producer and consumer prices will rise at a slower rate in 1991. Cold cereal remained dominant in both quantity and dollars.

Costs, Prices, and Consumption

Variable costs rose moderately in 1990, signaling slower rates of increase for producer and consumer prices. Although most ingredient prices rose, corn and rice declined substantially, yielding a slight drop in weighted average ingredient costs, as shown in Table 33. Paperboard box prices rose 4.9 percent, while those of carton liners were unchanged. Labor cost increases were minimal.

Trends and Forecasts: Cereal Breakfast Foods (SIC 2043)

(in millions of dollars except as noted)

Item	1987	1988[1]	1989[2]	1990[2]	1991[3]	Percent Change 1987-88	1988-89	1989-90	1990-91
Industry Data									
Value of shipments[4]	6,566	7,274	8,234	8,826	9,346	10.8	13.2	7.2	5.9
Value of shipments (1987$)	6,566	6,794	6,908	6,837	6,887	3.5	1.7	−1.0	0.7
Total employment (000)	16.0	16.4	16.6	16.7	16.8	2.5	1.2	0.6	0.6
Production workers (000)	13.1	13.7	13.9	14.0	14.0	4.6	1.5	0.7	0.0
Average hourly earnings ($)	16.85	17.29	17.81	18.48	—	2.6	3.0	3.8	—
Capital expenditures	333	362	—	—	—	8.7	—	—	—
Product Data									
Value of shipments[5]	5,081	5,667	6,415	6,876	7,281	11.5	13.2	7.2	5.9
Value of shipments (1987$)	5,081	5,223	5,310	5,257	5,295	2.8	1.7	−1.0	0.7

[1] Advance data from the 1988 Annual Survey of Manufactures.

[2] Estimate.

[3] Forecast.

[4] Value of all products and services sold by establishments in the cereal breakfast foods industry.

[5] Value of products classified in the cereal breakfast foods industry produced by all industries.

SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA). Estimates and forecasts by ITA.

These cost changes translated into an increase of 5.2 percent in the producer price of cold cereal and 2.3 percent for hot cereal. Retail prices were up 5.9 percent.

In 1990, the estimated decline in per capita consumption of all breakfast cereal, as shown in Table 34, reflected the cumulative impact of the 9.2 percent 1989 retail price jump, declining interest in ready-to-eat rice cereals, and continued stagnation of hot cereal consumption. Confusion among consumers about the advantages of bran-based, vitamin-fortified cereals also may have contributed to this outcome.

Among cold cereals, consumption both of oat products and of items in the "all other" category of multigrain and fiber expanded 3.1 percent. But rice products lost 2.1 percent, and hot cereal fell 2 percent. Price rises, however, caused an increase in the value of shipments, as shown in Table 35.

Marketing

Most companies accelerated development of specialized products appealing to diverse consumer groups. In 1990, children aged 5 to 15 years increased 1.2 percent; this group prefers presweetened cereals with product names licensed from movies, television shows, or cartoons. Such items are frequently based on fads and have life spans of four months to two years. Nevertheless, one firm has successfully used two licensed characters for 15 years. Of the top 99 cereals in 1989, 12 portrayed licensed characters.

In the adult market, people aged 35 to 54 years prefer products with health claims. This group grew 3.2 percent in 1990, to 25.3 percent of the population, while total population rose only 0.9 percent.

Oat bran has emerged as the symbol of allegedly healthful breakfast cereal. In 1989, 65 percent of the 118 breakfast cereal introductions contained the word "oats." But recent

Table 33: Price Changes of Cereal Ingredients

Ingredients	1986	1987	1988	1989	1990*
Wheat	−12.9	−4.6	28.7	16.9	15.0
Milled Rice	−17.9	−3.9	42.6	−11.2	−15.6
Oats	−20.5	−14.1	42.4	4.7	16.8
Corn	40.3	−8.0	15.3	3.6	−27.2
Wheat Flour	−5.4	−1.9	13.7	8.3	10.2
Refined Sugar	0.4	3.7	2.1	7.1	13.8
Dehydrated and Dried Fruits	3.6	3.4	4.3	3.9	7.1
Weighted Average except for corn	−9.3	−2.0	12.2	3.1	−0.7

*Estimate by U.S. Department of Commerce, International Trade Administration (ITA).

SOURCE: U.S. Department of Labor, Bureau of Labor Statistics.

Table 34: Apparent Consumption[1] Per Capita of Breakfast Cereals

(in pounds and kilograms[2])

Categories	1987	1988	1989[3]	1990[3]	1991[4]	1992[4]
TOTAL	11.73	11.88	12.83	12.52	12.63	12.66
	5.32	**5.41**	**5.82**	**5.68**	**5.73**	**5.74**
Imports less Exports	−0.82	−0.74	0.17	−0.28	−0.28	−0.40
	−0.37	**−0.34**	**0.08**	**−0.13**	**−0.13**	**−0.18**
Ready to eat	10.87	11.05	11.17	11.33	11.44	11.58
	4.91	**5.04**	**5.06**	**5.14**	**5.19**	**5.25**
Corn	3.30	3.35	3.40	3.41	3.43	3.46
	1.47	**1.52**	**1.54**	**1.55**	**1.56**	**1.57**
Wheat	3.46	3.54	3.59	3.66	3.70	3.75
	1.57	**1.61**	**1.63**	**1.66**	**1.68**	**1.70**
Oat	1.56	1.60	1.61	1.66	1.69	1.70
	0.71	**0.72**	**0.73**	**0.75**	**0.77**	**0.77**
Rice	1.05	1.01	0.95	0.93	0.89	0.89
	0.48	**0.49**	**0.43**	**0.42**	**0.40**	**0.40**
All other except baby cereal	1.50	1.55	1.62	1.67	1.73	1.78
	0.68	**0.70**	**0.73**	**0.76**	**0.78**	**0.81**
Hot cereal	1.68	1.57	1.49	1.47	1.47	1.48
	0.76	**0.71**	**0.68**	**0.67**	**0.67**	**0.67**
Instant	0.12	0.12	0.12	0.13	0.13	0.14
	0.05	**0.05**	**0.05**	**0.06**	**0.06**	**0.06**
Oatmeal	1.18	1.11	1.05	1.05	1.05	1.05
	0.54	**0.50**	**0.48**	**0.48**	**0.48**	**0.48**
Farina	0.34	0.30	0.28	0.25	0.25	0.25
	0.15	**0.14**	**0.13**	**0.11**	**0.11**	**0.11**
Mixed grains	0.04	0.04	0.04	0.04	0.04	0.04
	0.02	**0.02**	**0.02**	**0.02**	**0.02**	**0.02**

[1] Apparent consumption is domestic production, plus imports, less exports.

[2] Kilograms appear in boldface under the figures for pounds.

[3] Estimate by ITA.

[4] Forecast by ITA.

SOURCE: U.S. Department of Commerce: Bureau of the Census, and International Trade Administration (ITA).

Table 35: Product Shipments of Cereal Breakfast Foods

(in millions of dollars)

Industry	1987	1988	1989[1]	1990[2]	1991[2]
TOTAL	5,080.4	5,667.4	6,415.4	6,875.6	7,281.1
Ready-to serve	4,711.1	5,246.0	5,940.7	6,385.0	6,758.0
Corn items	1,302.3	1,479.2	1,669.4	1,786.0	1,869.0
Wheat items	1,359.6	1,544.2	1,756.5	1,892.2	1,982.2
Oat products	706.9	802.9	915.9	991.5	1,078.1
Rice products	518.1	588.5	619.2	638.3	634.7
Mixed grains	824.2	831.2	979.7	1,077.0	1,194.0
Hot cereals	353.4	403.5	454.7	469.1	500.3
Oatmeal	120.5	136.8	150.7	154.5	161.1
Instant	163.7	185.9	220.7	234.4	256.6
Farina	60.2	68.3	71.4	67.9	69.9
Mixed grains	9.0	12.5	11.9	12.3	12.7
Unspecified items	15.9	17.9	20.0	21.5	22.8

[1] Estimate by ITA.

[2] Forecast by ITA.

SOURCE: U.S. Department of Commerce: Bureau of the Census and International Trade Administration (ITA).

medical research has cast doubt on the cholesterol-reducing claims for oat bran, and many consumers seemed confused as the companies endeavored to maintain brand loyalty. During the first quarter of 1990, only 10 of 30 new products advertised oats in some form.

International Trade and Consumption

International trade in breakfast cereal is limited, as shown in Table 36. In 1990, exports of cereal represented 0.5 percent of product shipment value, up from 0.2 percent in 1989. The ratio of imports to consumption was 0.7 percent, gaining 0.1 percentage point from 1989. U.S. cereal makers prefer overseas production to exporting their goods.

Breakfast cereal, often manufactured by U.S. affiliates, is popular in other countries. During the decade ending in 1990, per capita consumption in 31 countries rose 1 percent a year, to 2.20 pounds.

Ireland and Canada are major consuming countries, as shown in Table 37. Although consumption has declined in the United Kingdom, it has risen steadily in such other European countries as Ireland, Denmark, Finland, Norway, and Sweden. Many people in Australia and New Zealand also consume significant quantities of breakfast cereal. Sales in Japan rose 60 percent in 1988, to $142 million, but per capita consumption remained far below U.S. levels. Consumption also has risen in Hong Kong and Singapore.

Cultural differences play a crucial role in marketing breakfast cereal abroad. To overcome the French perception of corn as animal fodder, for example, one company has aggressively promoted its corn-based cereals in France for 10 years. After spending about 15 percent of the revenue from annual sales on television advertising to strengthen its brand franchise, this firm now has a 60 percent share of the French corn cereal market.

Outlook for 1991

Total U.S. consumption will gain 1 percent, reversing the downturn of 1990. This projection is based on expectations that retail cereal price increases will be smaller than those of 1989 and 1990. Cold cereal consumption will increase 1 percent as many middle-aged consumers retain their loyalty to oat, fiber, and multigrain products. Cold cereal sales are likely to dominate future increases, as the number of consumers aged 35 to 54 years increases 3.2 percent, from 25.5 to 26.1 percent of the population, while total population grows only 0.8 percent. Consumers aged 35 to 54 are frequently at the peak of their earning potential, and according to the 1980–88 *Consumer Expenditure Surveys* by the Bureau of Labor Statistics, they consistently spend the most for breakfast cereal. This category of consumers spent 3.6 percent of their 1988 home food budget on breakfast cereal, while all other consumer units spent only 3.3 percent.

Prospects for hot cereal appear less favorable, but consumption will still rise 0.7 percent owing to its popularity with adults over 65 years of age and children under 5 years of age. In 1991, the over-65 population will grow 1.4 percent, with its share of total population rising from 12.6 percent to 12.7 percent. Population growth for children under 5 years of age will remain unchanged; their proportion of the population will fall from 7.4 percent to 7.3 percent.

Prices will increase in 1991 more rapidly than per capita consumption, and more rapidly than all retail food prices, because of the impact of higher energy costs and grain prices on production costs.

Other factors which will influence production and marketing costs in 1991 are packaging and advertising. New varieties and configurations of packaging tend to increase costs; in an effort to constrain such costs, companies may re-evaluate the feasibility of plastic containers. Total spending for advertising may exceed $900 million, up from $805 million in 1989. Meanwhile, capital expenditures from retained earnings could boost productivity by up to 5 percent.

The value of exports will probably rise as U.S. manufacturers sell to countries with insufficient demand to justify domestic manufacturing, and supply complementary brands

Table 36: 1990 U.S. Exports and Imports of Cereal Breakfast Foods Ranked by Top Five Countries*

(in millions of dollars)

Country	Value
Exports	
TOTAL	$30.7
Canada	15.5
Mexico	5.6
Niger	1.7
Dominican Republic	1.4
Belgium	1.3
All others	5.2
Imports	
TOTAL	$46.1
Canada	34.7
Colombia	4.4
Mexico	1.6
Switzerland	1.5
Costa Rica	1.4
All others	2.5

*Estimate by ITA.

SOURCE: U.S. Department of Commerce: Bureau of the Census and International Trade Administration (ITA).

Table 37: Apparent Per Capita Consumption[1] Of Breakfast Cereal In Selected Countries

(in pounds and kilograms[2] of natural cheese equivalent)

Country	1987	1988	1989[3]	1990[3]	1991[4]	1992[4]
United States	11.73	11.88	12.83	12.52	12.63	12.66
	5.32	**5.39**	**5.82**	**5.68**	**5.74**	**5.74**
New Zealand	7.85	8.29	8.47	8.65	8.84	9.03
	3.56	**3.76**	**3.84**	**3.92**	**4.00**	**4.10**
United Kingdom	6.07	6.70	7.11	7.54	7.68	7.83
	2.75	**3.04**	**3.22**	**3.42**	**3.48**	**3.55**
Australia	6.90	6.94	6.97	7.00	7.04	7.07
	3.13	**3.15**	**3.16**	**3.18**	**3.19**	**3.21**
Netherlands	8.45	8.06	7.69	7.31	6.94	6.58
	3.83	**3.66**	**3.49**	**3.32**	**3.15**	**2.98**
Canada	6.30	6.15	6.14	6.13	6.13	6.17
	2.86	**2.79**	**2.79**	**2.78**	**2.78**	**2.80**
France	0.99	1.10	1.82	1.65	1.87	1.92
	0.45	**0.50**	**0.82**	**0.75**	**0.85**	**0.87**
West Germany	2.35	1.75	1.74	1.79	1.84	1.89
	1.07	**0.79**	**0.79**	**0.81**	**0.83**	**0.86**
South Africa	0.84	0.73	0.69	0.75	0.72	0.76
	0.38	**0.33**	**0.31**	**0.34**	**0.33**	**0.34**
Taiwan	N.A.	0.26	0.34	0.45	0.59	0.70
	N.A.	**0.12**	**0.15**	**0.20**	**0.27**	**0.32**
Cuba	0.21	0.13	0.14	0.16	0.17	0.18
	0.10	**0.06**	**0.06**	**0.07**	**0.08**	**0.08**
South Korea	0.04	0.06	0.07	0.08	0.09	0.11
	0.02	**0.03**	**0.03**	**0.04**	**0.04**	**0.05**

[1] Apparent consumption is production, plus imports, less exports.

[2] Kilograms appear in boldface under the figures for pounds.

[3] Estimate by U.S. Department of Commerce, International Trade Administration (ITA).

[4] Forecast by ITA.

SOURCE: *United Nations Yearbooks of Demographics, Industrial Statistics, and International Trade.*

to countries in which there are U.S.-affiliated plants. Duty reductions under the U.S.-Canada Free Trade Agreement will help imports from Canada stay robust. More Hispanic consumers will purchase imported Latin American cereals.

Foreign consumption will continue to grow at a brisk pace as U.S. companies intensify their marketing efforts. More two-wage-earner households, the preference for convenience, and greater nutritional awareness will boost overseas cereal consumption. Australia and New Zealand will register substantial gains. As Japanese and South Korean consumers diversify from rice to other grains and become more accustomed to dairy products, cereal consumption will probably rise in Japan. New corporate arrangements will emerge to serve markets abroad. For example, a U.S.-Swiss joint venture will soon operate in Europe and Japan.

Long-Term Prospects

During 1991–96, U.S. per capita consumption of all cereal will expand 1.3 percent yearly. For the same period, the inflation-adjusted value of shipments should gain 1.9 percent.

If 1980s spending patterns hold in the future, consumers aged 35 to 54 will continue to prefer premium-priced cereals with health and nutrition characteristics. Cereal makers will continue to target this group.

Companies will continue to rely on licensed characters, sometimes with popularity measured in weeks, to attract consumers aged 5 to 15 years. This population category, which will remain 14.4 percent of the population, will grow only 0.8 percent annually between 1991 and 1996. Due to the proliferation of microwave ovens, both children under 5 years of age and individuals aged over 65 years of age will eat more instant hot cereals.

Producers will continue to modernize their already highly-automated plants using costly new extrusion machines and packaging equipment to produce multigrain, fiber, and fruit-filled cereals. This flexibility will enable them to better manage the increasingly short life cycles of breakfast cereals. Thus, the industry's value added—output less the value of inputs purchased from other industries—will rise noticeably. The fixed costs of sophisticated plants will become relatively more important than the variable expenses for labor, ingredients, and packaging. The variable costs of advertising and energy will remain crucial.

The industry's international elements will grow more complex. Through foreign subsidiaries, major cereal manufacturers will enter new countries and become more internationally oriented as they derive a larger portion of their earnings from off-shore sales. With the U.S.-Canadian Free Trade Agreement fully operative, certain companies may import more finished cereal products from Canada. In the European Community's emerging single market, joint ventures among American and European firms may become more common. A potential free trade agreement between the United States and Mexico may also afford new opportunities for expansion. Exports will complement international strategies with imports limited to specialty niches.—*William V. Janis, Office of Consumer Goods, (202) 377-2250, September 1990.*

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BAKERY PRODUCTS

The wholesale baked goods industry (SIC 205) has three segments: bread, cake, and related products (SIC 2051), cookies and crackers (SIC 2052), and frozen bakery items, except bread (SIC 2053). Frozen bread is part of 2051 but is not broken out.

In 1990, total value of product shipments in current dollars for the three bakery sectors reached an estimated $24.3 billion, up 6.7 percent, as shown in Tables 38, 39, and 40. Cookies and crackers led with a 9.0 percent growth rate. Bread, cake, and related items followed at 6.2 percent, while frozen bakery goods remained unchanged. Part of this overall dollar growth reflected the entry of 1,155 new products in 1989, up from 968 new products in 1988. Of this total, 175 new products displayed health claims on the package or label. The real (inflation adjusted) value of these shipments were: all baked goods up 1 percent; bread, cake, and related items up 0.7 percent; cookies and crackers up 2.6 percent; and frozen baked products down 3.1 percent.

Within each sector, performance by value varied in different product lines. For example, crackers soared an estimated 11.7 percent, and variety breads showed great strength, but most categories of frozen bakery products declined.

Trends and Forecasts: Bakery Products (SIC 205)

(in millions of dollars except as noted)

Item	1987	1988[1]	1989[2]	1990[2]	1991[3]	Percent Change 1987–88	1988–89	1989–90	1990–91
Industry Data									
Value of shipments[4]	23,677	24,157	26,197	27,956	30,238	2.0	8.4	6.7	8.2
2051 Bakery ex cookies	16,202	16,362	17,577	18,672	20,111	1.0	7.4	6.2	7.7
2052 Cookies and crackers	6,309	6,499	7,296	7,950	8,793	3.0	12.3	9.0	10.6
2053 Froz. bakery, ex bread	1,165	1,296	1,324	1,334	1,334	11.2	2.2	0.8	0.0
Value of shipments (1987$)	23,677	22,562	22,664	22,886	23,150	−4.7	0.5	1.0	1.2
2051 Bakery ex cookies	16,202	15,113	15,088	15,180	15,294	−6.7	−0.2	0.6	0.8
2052 Cookies and crackers	6,309	6,179	6,350	6,516	6,743	−2.1	2.8	2.6	3.5
2053 Froz. bakery, ex bread	1,165	1,269	1,227	1,189	1,114	8.9	−3.3	−3.1	−6.3
Total employment (000)	217	220	220	220	219	1.4	0.0	0.0	−0.5
2051 Bakery ex cookies	162	163	163	163	162	0.6	0.0	0.0	−0.6
2052 Cookies and crackers	45.4	47.0	46.9	47.1	46.9	3.5	−0.2	0.4	−0.4
2053 Froz. bakery, ex bread	9.9	10.7	10.7	10.5	10.2	8.1	0.0	−1.9	−2.9
Production workers (000)	128	129	129	130	129	0.8	0.0	0.8	−0.8
2051 Bakery ex cookies	86.5	86.4	87.3	87.4	87.0	−0.1	1.0	0.1	−0.5
2052 Cookies and crackers	33.9	34.3	33.8	34.6	34.3	1.2	−1.5	2.4	−0.9
2053 Froz. bakery, ex bread	7.5	8.1	8.1	8.0	7.7	8.0	0.0	−1.2	−3.8
Average hourly earnings ($)	10.27	10.47	10.78	11.16	—	1.9	3.0	3.5	—
2051 Bakery ex cookies	10.15	10.22	10.45	10.86	—	0.7	2.3	3.9	—
2052 Cookies and crackers	10.78	11.46	11.85	12.12	—	6.3	3.4	2.3	—
2053 Froz. bakery, ex bread	9.31	9.08	9.31	9.63	—	−2.5	2.5	3.4	—
Capital expenditures	736	685	—	—	—	−6.9	—	—	—
2051 Bakery ex cookies	519	446	—	—	—	−14.1	—	—	—
2052 Cookies and crackers	185	202	—	—	—	9.2	—	—	—
2053 Froz. bakery, ex bread	31.8	36.9	—	—	—	16.0	—	—	—
Product Data									
Value of shipments[5]	20,739	20,956	22,733	24,256	26,228	1.0	8.5	6.7	8.1
2051 Bakery ex cookies	13,513	13,470	14,470	15,372	16,556	−0.3	7.4	6.2	7.7
2052 Cookies and crackers	5,853	6,075	6,820	7,431	8,219	3.8	12.3	9.0	10.6
2053 Froz. bakery, ex bread	1,373	1,412	1,443	1,453	1,453	2.8	2.2	0.7	0.0
Value of shipments (1987$)	20,739	19,680	19,791	19,986	20,202	−5.1	0.6	1.0	1.1
2051 Bakery ex cookies	13,513	12,532	12,528	12,610	12,696	−7.3	−0.0	0.7	0.7
2052 Cookies and crackers	5,853	5,766	5,925	6,081	6,293	−1.5	2.8	2.6	3.5
2053 Froz. bakery, ex bread	1,373	1,332	1,337	1,295	1,213	0.7	−3.3	−3.1	−6.3

[1] Advance data from the 1988 Annual Survey of Manufactures.

[2] Estimate.

[3] Forecast.

[4] Value of all products and services sold by establishments in the bakery products industry.

[5] Value of products classified in the bakery products industry produced by all industries.

SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA). Estimates and forecasts by ITA.

Table 38: Product Shipments of Bread and Related Products

(in millions of dollars)

Product	1987	1988	1989[1]	1990[1]	1991[2]
TOTAL	13,513.0	13,469.7	14,469.4	15,371.9	16,556.5
Bread	5,648.2	5,630.2	6,243.7	6,726.5	7,347.6
White pan	3,146.6	3,136.6	3,449.1	3,696.3	4,021.0
Variety types	2,234.8	2,227.7	2,509.3	2,728.3	3,004.9
Unspecified kinds	266.8	265.9	285.3	301.9	321.7
Rolls, bread stuffing, and bread crumbs etc., including frozen	3,148.2	3,138.2	3,428.6	3,551.1	3,896.6
Sweet yeast goods, except frozen	884.1	881.2	885.7	929.7	989.6
Soft cakes, except frozen	1,620.5	1,615.3	1,626.4	1,781.6	1,828.1
Pies, except frozen	367.1	365.9	361.8	366.1	370.6
Pastries	49.0	48.8	48.8	51.3	54.1
Doughnuts, cake-type	555.9	554.1	557.5	590.0	618.6
Unspecified products	1,240.0	1,236.0	1,316.9	1,375.6	1,451.3

[1] Estimate by ITA.

[2] Forecast by ITA.

SOURCE: *1987 Census of Manufactures*, U.S. Department of Commerce: Bureau of the Census and International Trade Administration (ITA).

Table 39: Product Shipments of Cookies And Crackers

(in millions of dollars)

Product	1987	1988[1]	1989[1]	1990[1]	1991[2]
TOTAL	5,853.0	6,075.0	6,820.3	7,431.1	8,218.8
Cookies & related items	3,243.7	3,356.6	3,805.7	4,076.0	4,501.7
Cookies	2,994.4	3,102.4	3,538.2	3,806.6	4,227.9
Toaster pastries	97.8	101.5	103.8	106.4	108.6
Ice cream cones and cups	104.8	108.8	112.8	109.7	109.8
Unspecified products	46.7	43.9	50.9	53.3	55.4
Crackers and similar products	2,429.0	2,521.1	2,792.0	3,118.0	3,468.4
Crackers	2,203.1	2,286.6	2,530.6	2,825.7	3,144.1
Pretzels	206.3	214.1	239.4	269.1	299.8
Unspecified products	19.6	20.4	22.0	23.2	24.5
Unspecified cookies and crackers	180.3	197.3	222.6	237.1	248.7

[1] Estimate by ITA.

[2] Forecast by ITA.

SOURCE: *1987 Census of Manufactures*, U.S. Department of Commerce: Bureau of the Census and International Trade Administration (ITA).

Costs, Prices, and Patterns of Consumption

The 1989 surge in costs abated in 1990. As shown in Table 41, rates of increase for 14 of the 17 principal variable costs of bakery companies slowed in 1990 (only sugar, dry milk, and dried fruit prices advanced). Changes in packaging costs ranged from a 4.7 percent increase for paperboard boxes to a 3 percent decline for plastic wrapping. Average hourly wages gained 3.5 percent.

These results yielded a 4.8 percent rise in producer prices. Of 20 categories of producer prices for bakery products, increases ranged from 9.1 percent for cake-type doughnuts to 1.4 percent for snack pies. Consumer prices for all bakery goods rose 6.4 percent. Among 11 retail classifications for bakery products, prices of crackers, bread, and cracker products leaped 9.2 percent, while fresh biscuits, rolls, and muffins increased 5.6 percent.

Table 40: Product Shipments of Frozen Bakery Products, except Bread

(in millions of dollars)

Product	1987	1988	1989[1]	1990[1]	1991[2]
TOTAL	1,372.7	1,412.0	1,443.0	1,453.4	1,452.7
Frozen pies (fruit and cream types)	449.4	462.3	460.7	444.6	433.7
Sweet yeast goods (yeast-raised doughnuts, sweet rolls, coffeecake)	157.6	162.1	146.2	128.9	107.9
Soft cakes (pound, layer, sheet)	392.0	403.2	444.6	487.3	523.5
Doughnuts, cake-type (baking powder leavened)	58.5	60.2	63.9	67.7	71.1
Other frozen bakery prod (cookies, pastries, etc.)	288.0	296.2	298.3	294.2	284.2
Unspecified frozen bakery products	27.2	28.0	29.3	30.8	32.3

[1] Estimate by ITA.

[2] Forecast by ITA.

SOURCE: *1987 Census of Manufactures*, U.S. Department of Commerce: Bureau of the Census and International Trade Administration (ITA).

Table 41: Price Changes of Bakery Inputs

(in percentages)

Item	1987	1988	1989	1990[1]
Ingredients				
Wheat flour	-1.9	13.7	8.3	-4.2
Flour mixes	-1.1	8.5	6.7	-1.4
Sugar	3.7	2.1	7.1	13.8
Corn sweeteners	-4.7	2.4	21.4	4.1
100% vegetable shortening	1.5	27.4	-8.8	N.A.[2]
Dry milk	5.6	-3.6	15.6	20.6
Processed eggs	-13.3	-1.4	39.4	5.5
Chocolate	-0.3	-3.2	-5.5	-5.7
Dehydrated and dried fruits and nuts	3.4	4.3	3.9	7.1
Packaging				
Plastic wrapping	1.9	9.3	2.7	-3.0
Laminated paper	3.3	6.8	6.2	2.8
Paperboard boxes	3.6	4.9	8.3	4.7
Printed labels	1.2	2.8	4.4	0.9
Energy				
Natural gas	-11.3	-2.6	5.9	-2.2
Commercial electricity rates	-1.8	0.5	3.2	1.4
Diesel fuel	14.0	-10.3	18.5	12.3
Gasoline	7.5	-2.6	13.6	7.5

[1] Estimate by U.S. Department of Commerce, International Trade Administration (ITA).

[2] N.A. = Not available.

SOURCE: U.S. Department of Labor, Bureau of Labor Statistics.

Table 42: Per Capita Consumption of Frozen Bakery Products, except Bread

(in pounds and kilograms[1] per person)

Product	1987	1988	1989[2]	1990[2]	1991[3]	1992[3]
TOTAL	6.18	5.87	5.69	5.41	5.06	4.83
	2.80	**2.66**	**2.58**	**2.45**	**2.30**	**2.19**
Frozen pies (fruit and cream types)	1.96	1.81	1.71	1.56	1.39	1.28
	0.89	**0.82**	**0.78**	**0.71**	**0.63**	**0.58**
Sweet yeast goods (yeast-raised doughnuts, sweet rolls)	0.63	0.51	0.44	0.36	0.29	0.23
	0.29	**0.23**	**0.20**	**0.16**	**0.13**	**0.09**
Soft cakes (pound, layer, sheet)	1.46	1.55	1.62	1.68	1.70	1.74
	0.66	**0.70**	**0.73**	**0.76**	**0.77**	**0.79**
Doughnuts, cake-type (baking powder leavened)	0.34	0.35	0.35	0.35	0.35	0.35
	0.15	**0.16**	**0.16**	**0.16**	**0.16**	**0.16**
Other frozen bakery products (cookies, pastries, etc.)	1.79	1.65	1.57	1.46	1.34	1.23
	0.81	**0.75**	**0.71**	**0.66**	**0.61**	**0.56**

[1] Kilograms are listed in boldface type under the figures for pounds.

[2] Estimate by ITA.

[3] Forecast by ITA.

SOURCE: *1987 Census of Manufactures* and *Projections of the Population of the United States 1988 to 2080*, U.S. Department of Commerce: Bureau of the Census and International Trade Administration (ITA).

Frozen Products

Consumers have shown scant interest in frozen bakery items. Mirroring a trend that began in 1982, per capita consumption of these foods dropped an estimated 4.9 percent in 1990, as shown in Table 42. The only growth was in soft cakes.

New packaging and reformulation of these goods by the frozen bakery products industry have generated sales to the food service industry. One company has opened a plant dedicated exclusively to soft cake products.

The downward trend in frozen bakery products, due to consumers' concerns with diet, and to their lack of time for preparation, has prompted supermarkets to limit freezer space devoted to these items. Retail bakers and in-store supermarket bakeries have also affected frozen bakery goods sales. Various companies have reduced the weight of frozen baked goods to make them suitable for rapid microwave cooking.

Cookies and Crackers

The products of this industry sector have regularly recorded increased consumption. In 1990, estimated combined per capita consumption rose 4.0 percent. Cookies outpaced crackers, with a 3.8 percent gain, as shown in Table 43.

Per capita consumption of cookies showed strength almost across the board. Only per capita consumption of marshmallow cookies weakened somewhat. Companies are targeting many new premium brand cookies, often containing honey and fruit juices as alternative sweetners, aimed at health conscious consumers. Also in response to health conscious consumers, manufacturers are replacing tropical oils and white flour with soybean oil and whole wheat flour. Fruits and nuts are increasingly popular cookie ingredients, although chocolate remains a favorite. Chocolate chip cookies accounted for an estimated $1 billion in sales.

Despite declines for graham crackers and saltines, per capita consumption of crackers increased 3 percent. De-

Table 43: Per Capita Consumption Of Cookies And Crackers

(in pounds and kilograms[1] per person)

Item	1987	1988	1989	1990[2]	1991[2]	1992[3]
Cookies	11.76	12.22	13.17	13.67	13.92	14.37
	5.35	**5.53**	**5.97**	**6.20**	**6.31**	**6.53**
Sandwich	2.90	2.96	3.14	3.18	3.29	3.35
	1.32	**1.34**	**1.42**	**1.44**	**1.49**	**1.52**
Marshmallow	0.28	0.27	0.26	0.24	0.23	0.21
	0.13	**0.12**	**0.12**	**0.11**	**0.10**	**0.10**
Wafers for ice cream sandwiches	0.28	0.29	0.31	0.31	0.31	0.32
	0.13	**0.13**	**0.14**	**0.14**	**0.14**	**0.15**
All others	8.30	8.70	9.46	9.94	10.09	10.49
	3.76	**3.94**	**4.29**	**4.51**	**4.58**	**4.76**
Crackers	7.95	8.32	8.57	8.94	9.37	9.70
	3.60	**3.78**	**3.90**	**4.06**	**4.24**	**4.39**
Graham	0.70	0.70	0.69	0.68	0.67	0.67
	0.32	**0.32**	**0.31**	**0.31**	**0.30**	**0.30**
Saltines	2.14	2.10	2.02	1.97	1.92	1.89
	0.97	**0.95**	**0.92**	**0.89**	**0.87**	**0.86**
Cracker Sandwiches	0.51	0.52	0.52	0.53	0.54	0.54
	0.23	**0.24**	**0.24**	**0.24**	**0.24**	**0.24**
Cracker meal & crumbs	0.18	0.19	0.19	0.19	0.20	0.20
	0.08	**0.09**	**0.09**	**0.09**	**0.09**	**0.09**
Other crackers	4.42	4.81	5.15	5.57	6.04	6.40
	2.00	**2.18**	**2.34**	**2.53**	**2.74**	**2.90**
Pretzels	1.04	1.11	1.16	1.24	1.32	1.38
	0.47	**0.50**	**0.53**	**0.56**	**0.60**	**0.62**

[1] Kilograms are listed in boldface type under the figures for pounds.

[2] Estimate by ITA.

[3] Forecast by ITA.

SOURCE: *1987 Census of Manufactures* and *Projections of the Population of the United States 1988 to 2080*, U.S. Department of Commerce: Bureau of the Census and International Trade Administration (ITA); and Biscuit and Cracker Manufacturers Association.

mand for graham crackers among 5 to 15 year olds has slackened, but one company has successfully responded with licensed characters to promote its graham crackers. Saltines, a low-value-added commodity often bought by food service companies, do not lend themselves well to intensive marketing efforts. Other varieties of crackers have gradually replaced saltines on salad bars.

Bread, Rolls, and Sweet Goods

In 1990, estimated per capita consumption of all bread increased 1.5 percent; consumption of rolls and sweet goods each rose 2.6 percent. White pan bread accounted for 56 percent of all bread consumption. This basic product is popular among children under 5 years old and adults over 65, because it is easy to digest and costs less at retail than variety breads. Many bakers continue to reformulate their white pan breads to improve quality, with an emphasis on nutrition.

According to the National Restaurant Association, more people are eating bread products away from home. Bread item orders were 3 percent higher in the first half of 1989 than in the first half of 1988. Doughnuts, English muffins, and bagels are becoming especially popular. Per capita consumption of hamburger and hot dog rolls has slowed as restaurants have introduced entrees not requiring these products.

Certain specialty breads and rolls offer companies potential sales opportunities. Pita bread, also called pocket bread, has gained 10 percent a year for the past several years. In-store demonstrations and the bread's low fat and cholesterol levels have helped increase sales. Supermarkets offer pita at their salad bars to promote the idea that it can easily accommodate salad items. Bagels are also a new frontier in the roll market. Per capita consumption of bagels climbed 10.5 percent in 1990.

Sara Lee

Among frozen bakery goods, only soft cake consumption will increase in 1991.

International Trade and Investment

In 1990, the estimated value of all bakery exports rose 67.4 percent to $209.2 million, while total imports rose 6.9 percent to $367.1 million, as shown in Tables 45 and 46. The U.S.-Canada Free Trade Agreement, which removed tariff barriers, stimulated expansion of bakery exports. In 1990, total U.S. bakery exports represented 0.8 percent of aggregate product shipment value, up from 0.5 percent in 1989. Canada and West European countries were important import suppliers, with Mexico and Asian countries also entering the market. The ratio of all imports to total apparent consumption remained 1.5 percent.

Recent transactions by both domestic and overseas bakery companies have radically altered the investment balance. With the $2.5 billion sale by Kohlberg, Kravis & Roberts (KKR) of its 23 RJR Nabisco plants in Western Europe to BSN, a French food conglomerate, in 1989, and several smaller divestitures, U.S. foreign bakery investment almost disappeared. The sale of Nabisco, which goes against the trend of U.S. companies investing in the European Community in anticipation of EC92, was necessary for KKR's repayment of loans incurred for its leveraged buy out of RJR Nabisco. In 1989, U.S. companies liquidated a total of $2.8 billion worth of overseas assets for a final position of only $13 million, down from $1.3 billion book value in 1988. For 1989, return on the European investments of U.S. parent companies measured $56 million, down from $231 million in 1988. Meanwhile, 1989 capital inflows from foreign firms investing in the United States reached $215 million, bringing the total investment to $1 billion, more than double the $461 million level of 1985. In 1989, overseas bakery companies sustained a $29 million loss from their U.S. operations after a $78 million gain in 1988. This loss was due to the costs of absorbing new U.S. assets.

In 1990, Invus Group, the U.S. subsidiary of a Belgian corporation which already owns three mid-sized bread and roll bakeries, agreed to purchase General Biscuit of America, a division of BSN. The French company wished to sell its U.S. affiliate to concentrate on growing European and Asian markets.

Outlook for 1991

Constant-dollar value of product shipments for all baked items will increase an estimated 1.1 percent. Several factors will contribute to this outcome. First, moderate increases of ingredient prices and packaging likely will restrain manufacturers' costs. With the rise of retail prices of such bread substitutes as high-value-added breakfast cereals and frozen entrees, many consumers will maintain or increase their purchases of fresh bakery goods. Third, the bakery product mix will continue its evolution. Brisk sales of variety bread will continue, and white pan bread sales will increase, as shown in Table 44. Cookie sales will continue to exceed sales of crackers. Among frozen bakery items, only soft cakes will gain ground.

Cookies and crackers will increase the most, 3.5 percent adjusted for inflation. Bread and related goods will rise 0.7

Table 45: 1990 U.S. Exports and Imports of Bakery Goods for the Top Five Countries[1]

(in millions of dollars)[2]

Country	Bread, Cake, and Related Items	Value
	Exports	
TOTAL		$106.0
Canada		50.0
Bermuda		15.8
Philippines		7.2
Mexico		4.0
Japan		3.0
All others		26.0
	Imports	
TOTAL		$244.8
Canada		117.9
Denmark		45.6
Japan		12.2
United Kingdom		12.0
Mexico		6.8
All others		50.3
	Cookies and Crackers	
	Exports	
TOTAL		$ 89.0
Canada		35.7
Bermuda		16.1
Mexico		8.6
Japan		4.3
Jamaica		2.0
All others		22.3
	Imports	
TOTAL		$109.7
West Germany		16.4
United Kingdom		11.8
Denmark		9.1
Mexico		8.4
France		7.9
All others		56.1

[1] These classifications reflect a concordance of export and import codes under the Harmonized System. Therefore, these data are not directly comparable to numbers prior to 1989.

[2] Estimate by ITA.

SOURCE: U.S. Department of Commerce: Bureau of the Census and International Trade Administration (ITA).

Table 46: 1990 Exports and Imports of Bakery Goods for the Top Five Countries[1]

(in millions of dollars)[2]

Country	Frozen Bakery Products, except Bread and Rolls	Value
	Exports	
TOTAL		$14.2
Canada		2.6
Japan		2.1
Mexico		1.9
Bermuda		1.9
United Kingdom		1.6
All others		4.1
	Imports	
TOTAL		$12.6
Canada		2.6
Hong Kong		2.4
Japan		1.9
Italy		1.4
South Korea		1.3
All others		3.0

[1] These classifications reflect a concordance of export and import codes under the Harmonized System. Therefore, these data are not directly comparable to numbers before 1989.

[2] Estimate by ITA.

SOURCE: U.S. Department of Commerce: Bureau of the Census and International Trade Administration (ITA).

percent in constant dollars. Frozen bakery goods will drop 6.3 percent in real terms.

Forecasts of per capita consumption will follow the same pattern. Per capita consumption of cookies and crackers will expand 1.8 percent and 4.8 percent, respectively, reflecting a growing preference for crackers among adults aged 35 to 54. Among the 6 categories of bread and related goods, consumption will range from a 3.5 percent rise for sweet yeast goods to a 4.8 percent drop for cake-type doughnuts. Sales to the food service industry will stimulate consumption of sweet yeast goods, while consumers at home will substitute bagels and croissants for cake-type doughnuts at breakfast. Gradually emerging from its historical decline, white pan bread will gain slightly; variety breads will increase 2.5 percent. White pan bread will remain a favorite of children under 5 years old and adults over 65.

A sustained increase of diesel fuel and gasoline prices will erode projected 1991 growth for the bakery industry, since distribution of bakery products is an energy-intensive operation. Tractor trailers haul bakery products from plants to regional warehouses, and sales people then take the goods to individual retailers. Manufacturers have a noticeable portion

Table 44: Per Capita Consumption of Bread and Related Products

(in pounds and kilograms[1] per person)

Product	1987	1988[2]	1989[2]	1990[2]	1991[3]	1992[3]
Breads	47.69	48.68	49.19	49.93	50.53	51.34
	21.63	**22.08**	**22.32**	**22.63**	**22.93**	**23.27**
White pan	27.74	27.77	27.75	27.81	27.88	28.05
	12.58	**12.60**	**12.59**	**12.61**	**12.65**	**12.72**
Other types	19.95	20.91	21.44	22.12	22.65	23.29
	9.02	**9.48**	**9.73**	**10.02**	**10.28**	**10.55**
hearth incl French and Italian	5.64	6.06	6.33	6.63	6.91	7.21
	2.56	**2.75**	**2.87**	**3.00**	**3.13**	**3.27**
whole & cracked wheat	9.35	9.55	9.70	9.80	9.88	10.01
	4.24	**4.33**	**4.40**	**4.44**	**4.48**	**4.54**
rye & like	1.95	2.03	2.01	2.12	2.16	2.20
	0.88	**0.92**	**0.91**	**0.96**	**0.98**	**0.98**
all other	3.00	3.27	3.41	3.57	3.70	3.87
	1.36	**1.48**	**1.55**	**1.62**	**1.68**	**1.76**
Rolls	20.84	21.69	22.31	22.90	23.46	24.05
	9.45	**9.84**	**10.13**	**10.38**	**10.64**	**10.91**
Hamburger & hotdog	12.81	13.04	13.20	13.32	13.41	13.51
	5.81	**5.91**	**5.99**	**6.04**	**6.08**	**6.13**
Bagels	2.14	2.47	2.75	3.04	3.32	3.61
	0.97	**1.12**	**1.25**	**1.38**	**1.50**	**1.64**
Brown & serve	1.30	1.32	1.34	1.35	1.36	1.37
	0.59	**0.60**	**0.61**	**0.61**	**0.62**	**0.62**
Hearth	1.31	1.34	1.36	1.38	1.40	1.41
	0.59	**0.61**	**0.62**	**0.63**	**0.64**	**0.64**
English muffins	1.71	1.70	1.69	1.68	1.68	1.69
	0.78	**0.77**	**0.77**	**0.76**	**0.76**	**0.77**
Croissants	0.35	0.41	0.45	0.49	0.53	0.58
	0.16	**0.19**	**0.20**	**0.22**	**0.24**	**0.26**
Other bread type rolls	1.22	1.41	1.52	1.64	1.76	1.88
	0.55	**0.64**	**0.69**	**0.74**	**0.80**	**0.85**
Sweet yeast goods	3.61	3.78	3.90	4.03	4.17	4.30
	1.64	**1.72**	**1.77**	**1.83**	**1.89**	**1.95**
Doughnuts	1.14	1.29	1.41	1.54	1.67	1.80
	0.52	**0.59**	**0.64**	**0.70**	**0.76**	**0.82**
All other (coffee cakes, etc.)	2.47	2.49	2.49	2.49	2.50	2.50
	1.12	**1.13**	**1.13**	**1.13**	**1.13**	**1.13**
Soft cakes	6.79	7.21	7.52	7.81	8.06	8.30
	3.08	**3.27**	**3.41**	**3.54**	**3.66**	**3.76**
Snack cakes	5.61	6.05	6.38	6.70	6.99	7.26
	2.54	**2.74**	**2.89**	**3.04**	**3.17**	**3.29**
All other	1.18	1.16	1.14	1.11	1.07	1.04
	0.54	**0.53**	**0.52**	**0.50**	**0.49**	**0.47**
Pies	1.75	1.73	1.71	1.70	1.69	1.68
	0.79	**0.78**	**0.78**	**0.77**	**0.77**	**0.77**
Snack pies	1.37	1.41	1.43	1.45	1.47	1.49
	0.62	**0.64**	**0.65**	**0.66**	**0.67**	**0.68**
All other	0.38	0.32	0.28	0.25	0.22	0.19
	0.17	**0.14**	**0.13**	**0.11**	**0.10**	**0.09**
Cake-type doughnuts	1.47	1.40	1.30	1.26	1.20	1.20
	0.67	**0.64**	**0.59**	**0.57**	**0.54**	**0.54**

[1] Kilograms appear in boldface under the figures for pounds.

[2] Estimate by ITA.

[3] Forecast by ITA.

SOURCE: *1987 Census of Manufactures* and *Projections of the Population of the United States 1988 to 2080*, U.S. Department of Commerce: Bureau of the Census and International Trade Administration (ITA).

of their workers engaged in transportation—14.8 percent for breads and retailed items, and 6.2 percent for cookies and crackers, respectively. Manufacturers of frozen bakery products send their goods directly to warehouses owned by supermarket chains or wholesalers.

Long-Term Prospects

The inflation-adjusted value of product shipments for all bakery goods is forecast to rise 1.9 percent a year between 1991 and 1996. These real gains will result from gradually increasing prices for agricultural commodities, which will push up the prices of the finished products; from improved production efficiencies as a result of new capital expenditures; and from population growth. Rising 3.3 percent a year in real value, cookie and cracker shipments will outperform the total industry. In constant dollars, the bread and related products industry will generate 1.2 percent annual growth. The real value of product shipments of frozen bakery items will decline 5.5 percent each year.

From 1991 to 1996, per capita consumption of bread, cake, and similar products will increase 2.2 percent a year overall. Gains for white pan bread will continue to come from greater consumption by children aged under 5 years and adults over 65 years. If historical patterns hold, spending by consumers aged 35 to 54 years also will boost consumption of these goods. Results will range from 3.4 percent growth for sweet yeast goods to a 2 percent drop for cake-type doughnuts.

Per capita consumption of cookies and crackers should grow 3.1 percent annually, though the product mix will change somewhat. Due to health concerns, consumers will eat fewer marshmallow cookies. Without a breakout of the "all other" categories of both cookies and crackers, which represent about two-thirds of the market, discerning current and emerging trends will become more difficult.

American Soybean Association

Many bakers continue to reformulate their breads to improve quality and nutrition. This white pan bread is made with high protein soy flour.

Companies are targeting many new premium brand cookies toward health conscious consumers; these often contain honey and fruit juices as alternative sweeteners. Also in response to health conscious consumers, manufacturers are replacing tropical oils and white flour with soybean oil and whole wheat flour. Fruits and nuts are increasingly popular cookie ingredients, although chocolate remains a favorite. Chocolate chip cookies accounted for an estimated $1 billion in sales.

The spending patterns of one major demographic group, consumers aged 35 to 54 years, will help to spur consumption of baked goods. This group will grow 2.9 percent yearly from 1991 to 1996, to 29 percent of all U.S. population. Data in the 1980–88 *Consumer Expenditure Surveys* published by the Bureau of Labor Statistics show that this group regularly spends more for bakery products—in 1988, 9.7 percent of its aggregate outlays for all food at home want to baked goods, while all other groups spent 9.5 percent. People in this age group are also frequently at the peak of their earning potential.

During 1991-96, technical advancements will involve ingredients, production techniques, packaging, and distribution. Commercialization of research on a sucrose ester as an emulsifier to extend the shelf-life of bread may mean new options for consumers. Shelf-stable bread could find wide acceptance for specialized purposes such as military rations, disaster relief, and camping in remote areas. Sucrose ester also improves the stability of low-fat baked goods.

Bakery companies, particularly makers of cookies and crackers, will probably adapt aspects of extrusion used in other food industries. This engineering permits continuous blending of ingredients. The process yields a greater variety of products available to consumers, less waste in production, lower labor costs, smaller inventories of ingredients, and less energy consumption.

Firms will re-evaluate their use of more costly plastic packaging as petroleum becomes more expensive. For example, manufacturers may redesign plastic trays to hold more, or use smaller, less expensive paperboard boxes. State laws and municipal ordinances on solid waste will also influence them to alter their packaging.

To decrease dependence on gasoline-powered delivery vans and to address environmental concerns, companies will increasingly experiment with vehicles using propane. Short-range trucks for transporting baked goods to retailers will prove most feasible for conversion to propane.—*William V. Janis, Office of Consumer Goods, (202) 377-2250, October 1990.*

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CANDY AND OTHER CONFECTIONERY PRODUCTS

The candy and other confectionery products industry includes SIC 2064 (establishments engaged in manufacturing nonchocolate candy; glazed, candied, crystallized fruits and nuts; non-pharmaceutical cough drops; and chocolate candy made from chocolate inputs purchased from others), and also part of SIC 2066 (chocolate and cocoa products, including chocolate candy—principally solid chocolate bars—made from cocoa beans ground in the same establishments).

Table 47: Quantity and Value of Shipments of Confectionery, by Type of Product, 1988–89

(quantity in thousands of pounds; value in thousands of dollars)

Product Description	1988		1989	
	Quantity	Value	Quantity	Value
Shipments	4,570,304	8,278,379	4,697,615	8,561,960
Chocolate and chocolate-type confectionery	2,483,126	5,586,313	2,608,568	5,828,013
Solid	316,405	663,528	309,505	665,439
Solid	229,054	603,919	217,264	517,866
Enrobed or molded				
with candy, fruit, or nut center	1,181,969	2,533,423	1,269,450	2,567,639
with bakery product center	186,347	373,922	189,235	388,412
Panned	412,090	918,800	460,255	975,516
Assortments and other	147,418	471,600	161,864	539,373
Chocolate type n.s.k.[1]	9,843	21,121[2]	995	3,768
Nonchocolate-type confectionery	1,935,221	2,417,504	1,935,674	2,455,114
Hard candy	637,667	946,005	606,605	884,771
Chewy candy (including granola bars)	325,923	500,856	368,405	559,012
Soft candy	475,330	405,296	475,284	423,527
Iced coated	52,050	75,388	32,716	55,696
Panned	292,727	331,455	307,434	370,906
Licorice and licorice type	135,706	143,503	145,056	161,070
Nonchocolate type n.s.k.[1]	15,818[2]	15,002[2]	174	133
Confectionery n.s.k.[1,3]	151,957	274,562	153,373	278,833

[1] N.s.k.=Not specified by kind.

[2] Revised by 5 percent or more from previously published figures.

[3] Represents estimated data for small companies, typically those with fewer than five employees, that were not included in the mailing survey.

SOURCE: *Current Industrial Reports*, MA-20-D, U.S. Department of Commerce, Bureau of the Census.

In 1990, the value of total U.S. candy shipments by all manufacturers reached an estimated $9.1 billion, increasing about 6.7 percent compared to 1989. The value of total U.S. chocolate candy shipments, which includes chocolate candy produced by establishments in SIC 2064 and SIC 2066, was forecast to reach $6.2 billion, about 6 percent over 1989. The total quantity shipped rose an estimated 4.2 percent to 2.7 billion pounds. The value of nonchocolate candies shipments rose an estimated 4.3 percent in 1990, reaching about $2.4 billion, while total quantity shipped rose an estimated 1.5 percent to almost 2 billion pounds. Shipments for 1989 are shown in Tables 47 and 48.

Total U.S. candy consumption (U.S. production less exports plus imports) was forecast to reach about 5.2 billion pounds in 1990, 3 percent above 1989. Total consumption of chocolate and chocolate-type candies was estimated at 2.8

Table 48: U.S. Manufacturers' Confectionery Shipments: Quantity, Value, and Average Unit Values, 1980–89*

Item	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
Quantity Shipped (mil. lb)										
Total	3,488.2	3,629.9	3,797.9	4,064.3	4,265.5	4,326.4	4,196.4	4,230.5	4,570.3	4,697.7
Chocolate products	1,831.8	1,996.7	2,049.9	2,178.2	2,257.6	2,272.8	2,300.8	2,353.7	2,483.1	2,608.6
Nonchocolate products	1,516.6	1,489.1	1,572.8	1,699.9	1,810.0	1,855.8	1,696.5	1,736.1	1,935.2	1,935.7
Not specified by kind	139.8	144.1	175.2	186.2	197.8	197.7	199.2	140.7	152.0	153.4
Value of shipments (mil. $)										
Total	4,684.0	5,171.4	5,650.2	5,983.3	6,610.3	7,092.2	7,280.4	7,676.7	8,278.4	8,562.0
Chocolate products	3,137.8	3,517.4	3,798.5	3,981.4	4,371.1	4,608.5	4,856.4	5,285.2	5,586.3	5,828.0
Noncocolate products	1,358.9	1,446.0	1,591.0	1,726.2	1,933.8	2,154.6	2,064.5	2,142.3	2,417.5	2,455.1
Not specified by kind	187.3	207.5	260.7	275.7	305.4	329.1	339.5	251.3	274.6	278.8
Unit value ($/lb)										
All products	1.343	1.425	1.488	1.472	1.550	1.639	1.735	1.815	1.811	1.823
Chocolate products	1.714	1.762	1.853	1.828	1.936	2.028	2.111	2.246	2.250	2.234
Nonchocolate products	0.896	0.971	1.012	1.016	1.068	1.611	1.229	1.234	1.249	1.268
Not specified by kind	1.340	1.440	1.488	1.481	1.544	1.664	1.704	1.786	1.807	1.817

*Preliminary.

SOURCE: *Current Industrial Reports*, MA-20-D, U.S. Department of Commerce, Bureau of the Census.

billion pounds, an increase of 3.2 percent, while consumption of nonchocolate candies rose an estimated 1.9 percent to 2.22 billion pounds.

Per capita consumption of chocolate and nonchocolate candy was expected to rise 1.3 percent (to 10.4 pounds) and 1.1 percent (to 8.8 pounds) respectively. Per capita consumption of all types of candy, including those not specified by kind, was forecast to reach 20.1 pounds, up 1.5 percent for the year. Between 1980 and 1989, per capita consumption of all types of candy rose 2.3 percent annually.

The *1987 Census of Manufactures*, published by the U.S. Bureau of the Census in early 1990, indicates that the candy and other confectionery products industry included 624 companies, which operated 685 establishments. Approximately one-fifth of these establishments employ 100 or more persons, while 60 percent employ 19 or fewer persons. Among establishments reporting shipments of $100,000 or more in 1987, 165 firms were in the nonchocolate candy sector, 17 in other confectionery type products, and 150 larger establishments in the chocolate producing sector. In addition to the 150 larger establishments producing candy from purchased chocolate, the Census reported 11 establishments in SIC 2066 producing chocolate candy from cocoa beans ground in the same establishment.

International Trade

In 1990, the value of U.S. candy and other confectionery products exports was expected to reach about $209 million, 20 percent higher than 1989. Chocolate candy, which accounts for the majority of U.S. candy exports, was expected to rise about 23 percent, to $174 million, while the value of nonchocolate candy exports rose an estimated 9 percent, to $35 million. The value of chocolate and nonchocolate candy imports rose an estimated 15 percent and 7 percent, respectively.

Outlook for 1991

In 1991, the inflation-adjusted value of candy and other confectionery products industry (SIC 2064) shipments is forecast to rise about 1.8 percent. Total U.S. candy consumption is expected to exceed 4.7 billion pounds, rising an estimated 2 percent over 1990 levels; per capita consumption is forecast to reach about 20.4 pounds. A slowing economy is not expected to threaten domestic candy manufacturers because they produce lower price goods. However, demand for more costly imported candies is likely to be affected.

Long-Term Prospects

A slowing domestic and international economy, and the gradually aging and declining growth rate of the U.S. population, will produce reduced expectations for the U.S. candy industry over the next five years. The industry is expected to downsize mainly through mergers and acquisitions while emphasizing new product development targeted at an aging but affluent population. Exports will continue to figure strongly in manufacturers' marketing plans; however, a slowing world economy will pose problems. Between 1990 and 1995, the value of candy and other confectionery products industry shipments is forecast to increase at an average annual rate of 1.8 percent adjusted for inflation.—*Cornelius F. Kenney, Office of Consumer Goods, (202) 377-2428, September 1990.*

Additional References

(Call the Bureau of the Census at (301) 763-4100 for information about how to order Census documents.)

Confectionery Products, Current Industrial Report, 1989 MA 20D and previous editions, U.S. Department of Commerce, Bureau of the Census, Washington, D.C. 20233.

Sugar and Confectionery Products, 1987 Census of Manufactures, MC87-1-20F, U.S. Department of Commerce, Bureau of the Census, Washington, D.C. 20233.

National Confectioners Association, 7900 Westpark Drive, McLean, VA 22102. Telephone: (703) 790-5750.

ALCOHOLIC BEVERAGES

The alcoholic beverage industry includes the malt beverage (beer) industry (SIC 2082), wine and brandy products industry (SIC 2084), and the distilled spirits industry (SIC 2085).

In 1990 the value of alcoholic beverage sector industry shipments reached an estimated $23.1 billion exclusive of Federal excise taxes. This was an increase of about 5.1 percent over 1989, when the value of shipments also rose about 5 percent. Price increases accounted for over 40 percent of the change in the value of shipments. Adjusted for inflation, the value of shipments rose an estimated 2.8 percent in 1990, compared to a 2.1 percent increase in 1989.

Trends and Forecasts: Candy and Other Confectionery Products (SIC 2064)

(in millions of dollars except as noted)

Item	1987	1988[1]	1989[2]	1990[2]	1991[3]	Percent Change 1987-88	1988-89	1989-90	1990-91
Industry Data									
Value of shipments[4]	6,980	7,419	7,723	8,117	8,637	6.3	4.1	5.1	6.4
Value of shipments (1987$)	6,980	7,263	7,412	7,551	7,684	4.1	2.1	1.9	1.8
Total employment (000)	45.8	44.7	44.2	43.9	—	−2.4	−1.1	−0.7	—
Production workers (000)	37.0	36.3	36.0	35.8	—	−1.9	−0.8	−0.6	—
Average hourly earnings ($)	9.27	9.48	9.62	—	—	2.3	1.5	—	—
Capital expenditures	233	226	—	—	—	−3.0	—	—	—
Product Data									
Value of shipments[5]	6,910	7,474	7,825	8,240	8,784	8.2	4.7	5.3	6.6
Value of shipments (1987$)	6,910	7,316	7,510	7,665	7,815	5.9	2.7	2.1	2.0

[1] Advance data from the 1988 Annual Survey of Manufactures.

[2] Estimate.

[3] Forecast.

[4] Value of all products and services sold by establishments in the candy & other confectionery products industry.

[5] Value of products classified in the candy & other confectionery products industry produced by all industries.

SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA). Estimates and forecasts by ITA.

The value of malt beverage industry shipments were forecast to rise 3.6 percent in 1990 to $15 billion. Wine and brandy industry shipments reached almost $4.3 billion, 8.6 percent ahead of 1989 results. Adjusted for inflation, malt beverage and wine and brandy products shipments rose 3.4 percent and 2.5 percent, respectively. Propelled by substantial price increases, the estimated value of distilled spirits industry production—calculated by the Bureau of the Census in lieu of shipments value—rose by 7.4 percent in 1990 reaching a forecast $3.9 billion. However, adjusted for inflation, this production rose only fractionally, 0.8 percent.

The Bureau of Alcohol, Tobacco, and Firearms (BATF) disseminates data monthly on the production of beer, wine, brandy, and distilled spirits, and on withdrawals from inventory. These data are reported on a Federal fiscal year basis (October–September).

According to BATF, U.S. malt beverage industry production rose 2.2 percent, to 3.2 million barrels (31 gallons per barrel) during the first 9 months of fiscal year 1990 (FY90). Taxable beer withdrawals (product destined for domestic consumption and subject to Federal excise taxes) rose about 1.6 million barrels, or 1.2 percent. Withdrawals destined for export markets (not subject to excise taxes) rose more than 5 in the first 9 months of FY90.

Wine and Brandy

For the first 8 months of FY90, total U.S. wine production declined about 11 percent to 405,000 gallons. In contrast, taxable and nontaxable wine withdrawals for shipment to domestic and foreign customers rose more than 6 percent, to 214,000 gallons, during the 8 month period.

Production of still table wines, the largest production category, declined by almost 14 percent during the first eight months of FY90, mainly due to continuing weak demand for less costly jug-type wines. Production of effervescent wines declined by 16 percent. However, production of vermouth and other special natural wines, such as pear and other fruit wines and fortified wines, rose by 8.4 percent and 11.0 percent, respectively.

Production of wine coolers rose by almost 14 million gallons during the period, about 29 percent. Taxable withdrawals of wine coolers also rose more than 12 percent during the first eight months of FY90. These results led some analysts to conclude that the prolonged slide in wine cooler consumption was over and that demand was stabilizing.

Taxable withdrawals of bottled still wine, which account for more than 75 percent of all taxable withdrawals, rose about 5 percent during the period, while withdrawals of other special natural wines rose 18 percent. Taxable withdrawals of vermouth and effervescent wines declined somewhat. Tax free wine withdrawals for export rose 7.1 percent overall. Bottled still wine and effervescent wine withdrawals for export rose about 16 percent and 59 percent, respectively, although effervescent wines are not yet a major U.S. export product. Tax free withdrawals of bulk wine, which is usually blended with foreign wine and bottled abroad as a local product or bottled abroad and marketed as a U.S. product, declined sharply, 18 percent, due mainly to reduced Canadian demand for U.S. bulk product.

Distilled Spirits

According to BATF, net U.S. distilled spirits production rose by more than 22 percent during the first five months of FY90. Production of bourbon and other whiskey rose 19 percent, while brandy production increased almost 12 percent. In several smaller categories including gin and vodka, production declined 15 percent and 20 percent respectively. This contrast reflects shifting consumer spending patterns.

Total product withdrawals from distillers' premises (commercial shipments for all uses) rose 18.3 percent during the early months of FY90. Taxable withdrawals were virtually unchanged from the same period in FY89. However, withdrawals for export to foreign customers rose a resounding 110 percent for the period and accounted for 29 percent of total withdrawals.

Consumer spending for all alcoholic beverages declined in real terms during the first 6 months of 1990, and most analysts expect this trend to prevail for the year. During the first half year, inflation adjusted personal consumption expenditures (PCE) for all alcoholic beverages declined at an annualized rate of 1.5 percent. Inflation adjusted PCE for alcoholic beverages consumed in restaurants and public places declined by 2.1 percent, while spending for drinks at-home declined by only 1.2 percent. By comparison, between 1986 and 1989, real PCE for all alcoholic beverages declined at an average annual rate of 0.1 percent, real spending for drinks in public places declined 0.6 percent, and PCE for drinks at home rose 0.6 percent as shown in Table 49.

In nominal terms, PCE for all alcoholic beverages rose at an annualized rate of 2.1 percent, in the first 6 months of 1990, to $65.5 billion annualized. Nominal PCE for drinks at home reached $39.4 billion, rising about 3.3 percent, while spending for drinks consumed outside the home rose only 0.2 percent.

The 1988 Consumer Expenditure Survey (CES-88) conducted by the Bureau of Labor Statistics reported that the average annual alcoholic beverage expenditure of all households reached almost $269.00 that year, slightly more than 1 percent of total average annual consumer expenditures, as shown in Table 1. About 52 percent of expenditures are for

Table 49: Alcoholic Beverages Personal Consumption Expenditures

	Personal Consumption Expenditures				Average Annual Percent Change 1986–89	
	1986	1987	1988	1989		
	(in millions of current dollars)				Current Dollars	Constant Dollars
Alcoholic Beverages	59,282	61,066	63,153	65,515	3.4	−0.1
At home	36,580	37,316	38,127	39,625	2.7	0.2
Away from home	22,702	23,750	25,026	25,890	4.5	−0.6
Food and Other Beverages	431,382	459,763	488,940	518,644	6.3	1.3
At home	302,479	316,378	334,055	355,738	5.6	0.3
Away from home	128,903	143,385	154,885	162,906	8.1	3.8

SOURCE: U.S. Department of Commerce, Bureau of Economic Analysis.

beverages consumed at home. Spending for beer represents about 60 percent of at home consumption; spending for wine and whiskey and other drinks accounts for about 21 percent and 19 percent, respectively. Among average consumer expenditures for alcoholic beverages away from home, spending for other drinks, including whiskey, represents 43 percent of the total, followed by about 28 percent for beer, 14 percent for wine, and 15 percent for all kinds of alcoholic beverages purchased while on trips. These expenditures vary by age, as shown in Table 50.

International Trade

In 1990 U.S. alcoholic beverage exports totalled $542 million, an increase of 19 percent. By comparison, exports increased 38 percent in 1989 and 27 percent in 1988. The value of malt beverage and distilled spirits exports rose by 24 percent and 20 percent, respectively, while the value of wine and brandy industry exports increased 12 percent.

Japan is the major customer for U.S. alcoholic beverages. During the first 6 months of 1990, the value of total U.S. alcoholic beverage exports to Japan rose over 49 percent, representing more than 35 percent of the value of all alcoholic beverage exports, compared to about 30 percent during the first half of 1989. The value of U.S. whiskey exports to Japan rose about 38 percent during the first half of the year, while bottled and bulk table wine exports increased more than 26 percent. The value of U.S. beer exports to Japan rose a resounding 82 percent, to $30 million, during the first half, due in part to aggressive consumer marketing.

During the first half of 1990, the value of the principal U.S. wine and spirit products exported to Canada declined or did not increase proportionately to Canadian imports from other countries, as shown in Table 3. The value of beer imported by Canadian from the United States rose 0.6 percent, while Canada's beer imports from other countries rose 3.2 percent. In 1990, two U.S. brewers alleged harm and discrimination and petitioned the United States Government for an investigation of provincial beer policies and practices. The United States Trade Representative accepted the brewers' petition and commenced an investigation which will be concluded in 1991.

Also in 1990, the Office of the United States Trade Representative held a series of talks with representatives of Taiwan regarding improved market access for U.S. distilled spirits. Taiwan maintains an absolute state monopoly over the production and distribution of all alcoholic beverages. In 1986, the United States and Taiwan had agreed to conditions for access to the Taiwan market for U.S. beer and wine exports. The 1990 talks are intended to provide commensurate access for U.S. spirits; an agreement is expected to take effect in 1991.

The value of all U.S. distilled spirits imports reached an estimated $3.3 billion in 1990, increasing abut 6 percent over 1989. The value of malt beverage imports rose about 4.7 percent, due mainly to price increases.

Table 51: Canadian Alcoholic Beverage Imports from the U.S. for Selected Products, January–June 1990

Change in Value (in percentages)

	Imports from U.S.	Total imports	U.S. Marketshare	
			89	90
Spirits Products				
Whiskey	−10.7	−16.3	13.0	13.9
Rum	126.3	52.9	5.9	8.7
Cordials, liqueurs	−36.8	−4.7	12.1	8.0
Wine Products				
Sparkling wine	9.1	8.9	3.4	4.1
Bottled table wine	12.1	22.6	8.1	7.3
Bulk table wine	−1.9	34.7	30.3	22.1

SOURCE: Statistics Canada

For the first 6 months of 1990, the quantity of beer imported declined by almost 3 percent, as value rose 4.5 percent, thus reflecting an average increase in value of shipments of 2.5 percent. The value of whiskey imports, which accounts for more than 60 percent of all U.S. spirits imports, rose 30 percent during the first half of 1990, while quantity imported increased only 20 percent. The quantity of gin and vodka imported during this period declined by about 6 percent and 3 percent, respectively, while importers' prices rose only fractionally. Some analysts took this as a sign that the heretofore vibrant "white goods" drink sector (gin, vodka, tequilla, and other colorless, less flavorful drinks) might be susceptable to general consumption downturn.

Table 50: Per Capita Consumer Expenditures for Alcoholic Beverages, 1988

(by age)

Item	Total	Under 25	25–34	35–44	45–54	55–64	65 and over	65–74	75 and over
Average annual expenditures	25,891.85	16,373.17	25,770.27	33,077.72	33,204.87	25,765.35	17,296.69	20,119.90	13,339.49
Food, nonalcoholic beverages	3,748.01	2,455.07	3,664.02	4,636.19	4,814.60	3,951.78	2,580.67	3,013.40	1,938.54
Food at home	2,135.87	1,121.02	2,045.83	2,599.42	2,605.04	2,354.91	1,709.16	1,932.54	1,372.54
Food away from home	1,612.13	1,334.05	1,618.19	2,036.76	2,209.56	1,596.86	871.51	1,080.86	566.01
Alcoholic beverages	268.69	311.92	354.56	281.13	306.57	239.04	132.75	161.90	89.24
At home	138.83	153.99	172.64	146.90	152.80	139.50	75.16	86.27	58.38
Beer and ale	83.24	121.23	120.48	86.45	80.31	73.10	32.55	38.60	23.41
Whiskey	11.61	5.36	8.18	11.20	17.16	16.07	11.48	16.34	4.15
Wine	29.62	18.33	32.66	36.54	35.34	29.83	17.64	20.22	13.75
Other alcoholic beverages	14.37	9.08	11.31	12.71	19.99	20.50	13.49	11.12	17.06
Away from home	129.86	157.93	181.92	134.23	153.77	99.53	57.59	75.63	30.86
Beer and ale	36.23	54.46	55.07	36.03	41.46	23.17	12.33	16.43	6.14
Wine	18.51	22.58	24.22	19.06	22.45	13.98	13.98	13.31	4.82
Other alcoholic beverages	55.85	59.61	59.60	80.80	56.29	66.49	43.91	26.70	33.70
Alcoholic beverages purchased on trips	19.26	21.28	21.83	23.85	23.38	18.47	8.63	12.20	3.76

SOURCE: Consumer Expenditure Survey, U.S. Department of Labor, Bureau of Labor Statistics.

For the first 6 months of 1990, the quantity and value of U.S. wine imports declined by about 8 percent and 2.5 percent, respectively. France, which supplies the major share of U.S. imports by value, was especially hard hit. The quantity and value of U.S. imports of French wine fell 13 percent and 9 percent, respectively. The quantity of wine imported from other major European Community wine producing countries also declined, by between 3 percent and 25 percent. The import decline from the EC resulted in part from a decision of the U.S. Environmental Protection Agency (EPA) to ban wines with residues of an unapproved fungicide known as procymidone. Importers claim that the EPA decision could mean a trade loss of tens of millions of dollars to EC winemakers. Because the maker of procymidone had never requested that EPA establish a minimum tolerance level for the fungicide, regulations required that products containing any trace level of the fungicide be withheld from the market. Many analysts contend that wines containing procymidone are safe for consumers.

Alcohol Taxes

As part of the effort to narrow the Federal budget deficit, the bipartisan deficit reduction program enacted in October, 1990 included increases in alcoholic beverage excise tax rates. The new tax rates will take effect January 1, 1991 and will cover all beverages in manufacturers', and most wholesalers' and retailers' inventories as of that date.

The Federal excise tax rate on beer and other taxable malt beverages will also take effect on January 1, 1991, rising from $9.00 to $18.00 per 31 gallon barrel. The new tax on a 6-pack of 12 ounce bottles or cans will be over 32 cents, compared to 16 cents in 1990. Some beer industry analysts estimate that a tax increase of this magnitude could cut beer consumption by 2 to 4 percent in the first year and cause the retail price of a 6 pack to rise 8 percent to 10 percent.

Effective January 1, 1991, the excise tax rate on bottled still table wine will be $1.07 per liquid gallon, rising from 17 cents per liquid gallon. The Federal tax levied on the typical 750 milliliter bottle of table wine will increase by 19 cents, from 3 cents per bottle to 22 cents.

Industry analysts agree unanimously that the tax hike will not help wine sales, but there is no consensus as to more specific likely consequences. Many analysts contend that less costly wines, such as those selling for $3–4 per bottle, would be more affected since the tax increase would result in a significant percentage rise in the price. Premium wines ($6–10 per bottle) are thought to be less vulnerable to tax related sales pressures; wines selling for more than $10 or 15 per bottle are considered relatively immune, since the tax rise constituts an insignificant fraction of the final price. Most analysts agree

Trends and Forecasts: Alcoholic Beverages (SIC 2082, 2084, 2085)

(in millions of dollars except as noted)

Item	1987	1988[1]	1989[2]	1990[2]	1991[3]	Percent Change 1987–88	1988–89	1989–90	1990–91
Industry Data									
Value of shipments[4]	20,239	20,919	21,976	23,099	24,295	3.4	5.1	5.1	5.2
2082 Malt beverages	13,619	13,922	14,507	15,029	15,706	2.2	4.2	3.6	4.5
2084 Wines & brandy	3,179	3,529	3,830	4,160	4,382	11.0	8.5	8.6	5.3
2085 Distilled liquor	3,441	3,469	3,639	3,910	4,207	0.8	4.9	7.4	7.6
Value of shipments (1987$)	20,239	20,692	21,124	21,540	21,852	2.2	2.1	2.0	1.4
2082 Malt beverages	13,619	13,823	14,126	14,423	14,679	1.5	2.2	2.1	1.8
2084 Wines & brandy	3,179	3,464	3,617	3,708	3,745	9.0	4.4	2.5	1.0
2085 Distilled liquor	3,441	3,404	3,382	3,409	3,429	−1.1	−0.6	0.8	0.6
Total employment (000)	54.2	55.2	53.9	52.6	—	1.8	−2.4	−2.4	—
2082 Malt beverages	31.9	32.6	31.9	31.0	—	2.2	−2.1	−2.8	—
2084 Wines & brandy	13.5	14.3	14.0	13.8	—	5.9	−2.1	−1.4	—
2085 Distilled liquor	8.8	8.3	8.0	7.8	—	−5.7	−3.6	−2.5	—
Production workers (000)	36.0	36.6	35.7	34.2	—	1.7	−2.5	−4.2	—
2082 Malt beverages	22.7	23.3	22.8	21.6	—	2.6	−2.1	−5.3	—
2084 Wines & brandy	7.0	7.4	7.2	7.0	—	5.7	−2.7	−2.8	—
2085 Distilled liquor	6.3	5.9	5.7	5.6	—	−6.3	−3.4	−1.8	—
Average hourly earnings ($)	17.67	17.78	17.90	—	—	0.6	0.7	—	—
2082 Malt beverages	20.76	20.77	20.90	—	—	0.0	0.6	—	—
2084 Wines & brandy	11.32	11.68	11.90	—	—	3.2	1.9	—	—
2085 Distilled liquor	13.05	13.55	13.90	—	—	3.8	2.6	—	—
Capital expenditures	617	709	—	—	—	14.9	—	—	—
2082 Malt beverages	474	572	—	—	—	20.7	—	—	—
2084 Wines & brandy	99.9	104	—	—	—	4.1	—	—	—
2085 Distilled liquor	43.9	33.4	—	—	—	−23.9	—	—	—
Product Data									
Value of shipments[5]	19,842	20,458	21,510	22,573	23,735	3.1	5.1	4.9	5.1
2082 Malt beverages	13,521	13,742	14,319	14,835	15,503	1.6	4.2	3.6	4.5
2084 Wines & brandy	3,133	3,523	3,830	4,127	4,346	12.4	8.7	7.8	5.3
2085 Distilled liquor	3,188	3,194	3,361	3,611	3,886	0.2	5.2	7.4	7.6
Value of shipments (1987$)	19,842	20,199	20,627	21,043	21,340	1.8	2.1	2.0	1.4
2082 Malt beverages	13,521	13,644	13,943	14,237	14,489	0.9	2.2	2.1	1.8
2084 Wines & brandy	3,133	3,435	3,573	3,672	3,705	9.6	4.0	2.8	0.9
2085 Distilled liquor	3,188	3,119	3,112	3,135	3,147	−2.2	−0.2	0.7	0.4

[1] Advance data from the 1988 Annual Survey of Manufactures.

[2] Estimate.

[3] Forecast.

[4] Value of all products and services sold by establishments in the alcoholic beverages industry.

[5] Value of products classified in the alcoholic beverages industry produced by all industries.

SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA). Estimates and forecasts by ITA.

that on-premise wine sales—wines consumed in restaurants, clubs, and other retail establishments—are not likely to be affected significantly.

Effective January 1, 1991, excise taxes on distilled spirits will increase by $1.00 (8 percent), to $13.50 per proof gallon (50 percent alcohol by volume). The distilled spirits industry, which experienced a Federal excise tax hike of 19 percent in 1985, claims that the 1985 tax increase caused more than a 5 percent decline in sales. This was in addition to declines attributed to health concerns and changing purchase preferences.

Industry observers point out that if consumer response to this new tax increase is proportionate to the 1985 response, distilled spirit sales may decline by about 2 to 3 percent because of the new tax, exclusive of declines due to other causes.

Outlook for 1991

Unsettled domestic economic conditions and the excise tax increases will dampen demand for alcoholic beverages in 1991. Overall alcoholic beverage consumption is likely to fall. Tax increases, combined with an anticipated downturn in consumer purchasing patterns, will affect spirits consumption relatively more than wine. Beer sales will be least affected.

According to a late 1990 public opinion poll conducted by a leading U.S. survey firm, 9 percent of consumers said that they would purchase less expensive alcoholic beverage products in the event of a recession. One quarter of respondents said that they would continue to purchase preferred brands. However, 18 percent indicated that they would quit purchasing alcoholic beverages altogether. These responses indicate that consumers will likely react to economic forces as well as to excise tax increases. Adjusted for inflation, the value of total alcoholic beverage industry shipments is forecast to increase slightly, mainly because of continuing strong export sales.

Long-Term Prospects

The adverse consequences of the 1991 tax increases and slowing domestic economy are likely to have long reaching effects on the U.S. alcoholic beverage industry. Moreover, there is no evidence that health and social concerns, which depress demand, are likely to change in the foreseeable future. Thus, the U.S. alcoholic beverage industry is expected to shrink somewhat in the next five years. The workforce will decrease, and less competitive firms will fail or be absorbed. Manufacturers are expected to emphasize export efforts, but substantial progress may be difficult because of competition and a slowing international economy. Between 1991 and 1995 the inflation-adjusted value of total alcoholic beverage industry shipments is forecast to remain static at best, but more likely, to decline by between .03 percent and .06 percent annually.—*Cornelius Kenney, Office of Consumer Goods, (202) 377-2428, October 1990.*

Additional References

(Call the Bureau of the Census at (301) 763-4100 for information about how to order Census documents.)

1987 Census of Manufacturers, MC87-1-20H, Beverages, Bureau of the Census, U.S. Department of Commerce, Washington, DC 20233.

Advertising Age, 740 North Rush St., Chicago, IL 60611. Telephone:

Jobson's Handbook, Jobson Publishing Corp., 352 Park Avenue South, New York, NY 10010. Telephone:

Beverage Industry, 1 East First Street, Duluth, MN 55802. Telephone:

Monthly Statistical Reports Beer, Wine, and Distilled Spirits, published by the Bureau of alcohol, Tobacco, and Firearms, Department of the Treasury, Washington, DC 20230. Telephone:

BOTTLED AND CANNED SOFT DRINKS

The bottled and canned soft drink industry (SIC 2086) includes establishments ("bottlers") engaged primarily in the production and wholesale distribution of nonalcoholic soft drinks. Bottlers may also produce such other nonalcoholic drinks such as lemonade, iced tea, fruitades with or without real juice, and bottled pasteurized waters. Domestic bottlers of mineral and natural spring waters are *not* included in SIC 2086 but are considered part of SIC 5149, Wholesale Trade. However, import and export trade data for mineral and spring waters are included in SIC 2086.

Soft drink bottlers are either independent business entities, which operate single or multiple bottling plants; or subsidiaries of the companies which produce the soft drink syrups and franchise the brand names to local bottlers. These local bottlers then produce the drink from purchased ingredients.

In 1990, the value of bottled and canned soft drink industry shipments rose an estimated 6.4 percent to over $26 billion dollars. Adjusted for inflation, this was a rise of about 3.8 percent, somewhat ahead of the average growth rate of 3.5 percent every year since 1987.

Trends and Forecasts: Bottled and Canned Soft Drinks (SIC 2086)

(in millions of dollars except as noted)

Item	1987	1988[1]	1989[2]	1990[2]	1991[3]	Percent Change 1987-88	1988-89	1989-90	1990-91
Industry Data									
Value of shipments[4]	22,006	23,222	24,590	26,170	27,950	5.5	5.9	6.4	6.8
Value of shipments (1987$)	22,006	22,756	23,576	24,481	25,409	3.4	3.6	3.8	3.8
Total employment (000)	95.6	95.8	93.6	92.0	—	0.2	−2.3	−1.7	—
Production workers (000)	35.4	35.3	34.3	33.8	—	−0.3	−2.8	−1.5	—
Average hourly earnings ($)	10.45	10.79	11.06	—	—	3.3	2.4	—	—
Capital expenditures	569	562	—	—	—	−1.2	—	—	—
Product Data									
Value of shipments[5]	19,780	20,809	21,990	23,320	24,842	5.2	5.7	6.0	6.5
Value of shipments (1987$)	19,780	20,391	21,023	21,653	22,280	3.1	3.1	3.0	2.9

[1] Advance data from the 1988 Annual Survey of Manufactures.

[2] Estimate.

[3] Forecast.

[4] Value of all products and services sold by establishments in the bottled and canned soft drinks industry.

[5] Value of products classified in the bottled and canned soft drinks industry produced by all industries.

SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA). Estimates and forecasts by ITA.

International Trade and Markets

Because of the difficulties and costs associated with shipping soft drinks over long distances, foreign trade is not significant; most U.S.-brand soft drinks that are for foreign consumption are produced abroad under license. In 1990, the value of U.S. soft drink exports reached an estimated $85 million, declining about 15 percent from 1989 levels, which had been influenced by unusually large shipments to Japan. (In 1989, due to various factors, Japan had found it cheaper to import U.S. soft drinks than to produce them domestically.) The value of soft drink imports, including mineral and other bottled water, reached an estimated $190 million in 1990. During the first six months of 1990, the value of total mineral water imports rose almost 23 percent, to $68 million, while the quantity of imports rose more than 38 percent. Analysts observed that this sharp increase reflected other suppliers' shipments substituting for Perrier while its products were unavailable. During the first half of 1990, the overall value of imported carbonated soft drinks declined almost 11 percent to about $12 million.

Although the United States does not export a significant quantity of finished soft drink products, U.S. brands hold the dominant market share internationally. U.S. soft drinks produced abroad account for between 55 percent and 60 percent of the international soft drink market. The total international market is estimated to be about 70 percent larger than the U.S. market, or about 13 billion cases annually.

The large U.S. soft drink franchise companies pursue a marketing strategy abroad which involves in-country bottling firms, usually owned by citizens of that country, and a heavy emphasis on building brand franchise through advertising and promotion. Potential in most foreign countries is great because of low per capita consumption. For example, one major company reported a 10 percent increase in international sales in 1989, compared to a 2.5 percent increase in U.S. gallon-sales. According to the Coca-Cola company, per capita consumption of its brand name products abroad ranges from a low of four 8-ounce servings per year in Indonesia, to 55 such servings in Korea, 112 in Colombia, and 205 servings in Australia. Early in 1990, Pepsi-Cola International announced a new agreement with the Soviet Union which would more than double the number of its franchised bottling plants in the Soviet Union to 49 within five years.

Bottled Water

Americans are turning increasingly to bottled water as a substitute for tap water, and to carbonated bottled water as an alternative to alcoholic beverages and/or soft drinks. Industry analysts predict that total consumption of all types of bottled waters will reach 2.4 billion gallons by the end of 1990, a 16 to 20 percent increase over 1989. Between 1984 and 1989, U.S. bottled water consumption rose by 13 percent a year. The value of bottled water sales is expected to grow by only 10 percent in 1990, to about $2.4 billion, because competition has driven prices down.

According to the International Bottled Water Association (IBWA), total per capita bottled water consumption in 1988 reached 6.4 gallons. Still waters accounted for about 89 percent of consumption, while all types of sparkling waters—naturally and artificially carbonated—comprised the remainder. There were 475 U.S. water bottling plants producing 600 specific brands in 1988, including 75 imported brands.

Demand for still drinking waters appears to be growing faster than demand for sparkling (carbonated) waters, although continued growth in sales will depend on consumer response to criticism of the purity and origin of bottled still waters. Proper labeling may become an issue. Recent surveys indicate that most consumers choose bottled still water for taste rather than because of concerns about tap water impurities.

In recent years, consumption of sparkling waters has increased substantially, especially in bars and restaurants. Early in 1990, the leading imported brand of sparkling water, Perrier, was recalled because of benzene contamination. Following that, Perrier products were unavailable for several months while the company remodeled its French bottling facilities. Many consumers switched to other brands during this period, and the Food and Drug Administration (FDA) required Perrier to change its label before allowing the product to be reintroduced, contending that the claim on the label that the phrase "naturally sparkling" was misrepresentation. Perrier extracts the water and carbon dioxide separately from its spring and recombines the water and gas during the bottling process. The claim is omitted from the new labels.

Outlook for 1991

In 1991, soft drink consumption is forecast to rise by 2.2 to 2.6 percent, continuing the slower lower rate of growth of recent years, due to lower consumption by an aging population. Consumers are likely to experiment with the recently introduced alternative soft drinks such as the isotonics (drinks which replace essential minerals), carbonated juices, and canned coffee-type drinks. Principal ingredient costs are expected to rise modestly. The major brand franchise companies are expected to make further acquisitions to better exploit distribution and marketing efficiencies. The inflation-adjusted value of industry shipments is forecast to rise about 2.9 percent.

Long-Term Prospects

The 5 year industry outlook is unclear. A slowly growing population will provide fewer new consumers, and demographic shifts—especially a rising elderly population—will also affect consumption, as people over 45 consume fewer bottled and canned soft drinks. Franchise companies are likely to further increase their company-owned-and-operated bottling networks, which will increase profits and result in added competitive pressure on other brands. Between 1991 and 1995, the inflation-adjusted value of bottled and canned soft drink industry shipments is expected to increase 1.5 to 2.0 percent a year.—*Cornelius Kenney, Office of Consumer Goods, (202) 377-2428, September 1990.*

Additional References

(Call the Bureau of the Census at 301-763-4100 for information about how to order Census documents.)

Beverage Marketing Corporation, 2670 Commercial Way, Mingo Junction, OH 43938. Telephone: (614) 598-4133.

Advertising Age, 740 North Rush Street, Chicago, IL 60611. Telephone: (312) 649-5200.

Beverage World, 150 Great Neck Road, Great Neck, NY 11021. Telephone: (516) 829-9210.

1987 Census of Manufacturers, MC87-1-20H(P), U.S. Department of Commerce, Bureau of the Census, Washington, DC 20233.

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Apparel

Apparel industry shipments declined in 1990 in both current and constant dollars, as consumer demand weakened. Imports maintained an important presence in the U.S. market, increasing moderately.

For the first time since 1985, shipments by the apparel and finished textile products industry (SIC 23) declined in current dollars in 1990. Although shipments were down by 1.0 percent from the preceding year, they were at the second highest level on record. In constant (1987) dollars, industry shipments declined 4.4 percent in 1990. Thus, although the five-year upswing in current-dollar shipments ended, they remained at a relatively high level.

Before reading this chapter, please see "How to Get the Most Out of This Book" on page 1. It will clarify questions you may have concerning data collection procedures, factors affecting trade data, forecasting methodology, the use of constant dollars, the difference between industry and product data, source and references, and the Standard Industrial Classification system (SIC).

Consumer spending on clothing continued to rise in 1990, although in real terms the increase was only about 1 percent, considerably less than the 4.8 percent increase recorded in 1989. In addition to more sluggish demand, the downturn in shipments also reflected the uncertainty and volatility in the U.S. retail sector, which influenced the apparel companies' customers, that is, retailers, to purchase more conservatively, while at the same time making apparel suppliers somewhat reluctant to ship to financially troubled outlets. Another negative factor was a higher level of apparel inventories than the preceding year. Although inventories were not as excessive as during the industry's previous downturn in 1984–85, they had a dampening effect on new orders flowing to apparel manufacturers.

U.S. Trade Patterns in 1989

Selected Apparel

SIC 231, 2321, 2322, 2323, 2325, 2326, 2331, 2335, 2337, 234, 236, 239

(in millions of dollars, percent)

Exports	Value	Share	Imports	Value	Share
Canada & Mexico	573	30.3	Canada & Mexico	1,092	6.8
South America	57.4	3.0	South America	455	2.8
European Community	124	6.5	European Community	480	3.0
East Asia NICs	57.8	3.1	East Asia NICs	8,780	54.5
Japan	141	7.4	Japan	173	1.1
Other	936	49.6	Other	5,131	31.8
World Total	1,889	100.0	World Total	16,111	100.0

Top Five Countries

	Value	Share		Value	Share
Mexico	434	23.0	Hong Kong	2,625	16.3
Dominican Republic	287	15.2	China	1,685	10.5
Japan	141	7.4	Taiwan	1,579	9.8
Canada	138	7.3	South Korea	1,428	8.9
Costa Rica	134	7.1	Mexico	877	5.4

See "How to Get the Most Out of This Book" for definitions of the Country Groupings.

SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA).

Much of the weakness in apparel in 1990 was in menswear. After an upsurge in the preceding year, shipments of men's trousers (SIC 2325) turned down, as the resurgence in sales of jeans ebbed and sales of the popular casually styled cotton slacks moderated. Shipments of men's underwear and nightwear (SIC 2322) also slipped after gaining in 1989.

Shipments by the women's outerwear sector (SIC 2331, 2335, and 2337) were relatively flat in current-dollar terms

Trends and Forecasts: Apparel and Other Finished Textile Products (SIC 23)

(in millions of dollars except as noted)

Item	1987	1988[1]	1989[2]	1990[2]	Percent Change 1987–88	Percent Change 1988–89	Percent Change 1989–90
Industry Data							
Value of shipments[3]	64,050	65,031	66,397	65,733	1.5	2.1	−1.0
Value of shipments (1987$)	64,050	63,205	62,995	60,250	−1.3	−0.3	−4.4
Total employment (000)	1,081	1,066	1,060	1,024	−1.4	−0.6	−3.4
Production workers (000)	912	895	878	842	−1.9	−0.3	−4.1
Average hourly earnings ($)	6.12	6.35	6.59	6.85	3.8	3.8	4.0
Product Data							
Value of shipment[4]	62,119	62,750	64,005	63,301	1.0	2.0	−1.1
Value of shipment (1987$)	62,119	60,961	60,726	58,021	−1.9	−0.4	−4.4

[1] Advance data from the 1988 Annual Survey of Manufactures.

[2] Estimate.

[3] Value of all products and services sold by establishments in the apparel and other finished textile products industry.

[4] Value of products classified in the apparel and other finished textile products industry.

SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA). Estimates and forcasts by ITA.

for the third consecutive year. In a reversal of 1989, a gain in dress shipments was offset by a decline in shirts and blouses.

Employment

Employment in the U.S. apparel industry declined slightly during the 1987–1989 period, about 1 percent per year, but in 1990 the decline was a more substantial 3.4 percent. The 1990 performance is more in line with the earlier periods of 1980–85, when employment fell at an average rate of about 4 percent annually. Employment declines in apparel reflect the deep inroads into U.S. markets made by imports, and the efforts by domestic manufacturers to improve efficiency by streamlining and consolidating operations.

U.S. Exports and Imports
Selected Apparel
(in millions of dollars except as noted)

SIC	Industry	1989	1990[1]	1991[2]	Percent Change 1989-90	Percent Change 1990-91
2311	Men's and boys' suits and coats					
	Value of exports	104	138	—	32.7	—
	Value of imports	777	677	—	−12.9	—
2321	Men's and boys' shirts					
	Value of exports	224	306	—	36.6	—
	Value of imports	2,519	2,678	—	6.3	—
2322	Men's & boys' underwear + nightwear					
	Value of exports	53.1	88.8	—	67.2	—
	Value of imports	173	174	—	0.6	—
2323	Men's and boys' neckwear					
	Value of exports	12.6	11.6	—	−7.9	—
	Value of imports	104	110	—	5.8	—
2325	Men's and boys' trousers and slacks					
	Value of exports	397	468	—	17.9	—
	Value of imports	1,885	2,294	—	21.7	—
2326	Men's and boys' work clothing					
	Value of exports	0.0	0.0	—	—	—
	Value of imports	4.6	2.8	—	−39.1	—
2331	Women's & misses' blouses & shirts					
	Value of exports	36.8	33.1	—	−10.1	—
	Value of imports	2,857	2,871	—	0.5	—
2335	Women's, junior's, & misses' dresses					
	Value of exports	49.0	60.6	—	23.7	—
	Value of imports	884	962	—	8.8	—
2337	Women's and misses' suits and coats					
	Value of exports	219	244	—	11.4	—
	Value of imports	4,043	4,370	—	8.1	—
2341	Women's and children's underwear					
	Value of exports	88.4	92.7	—	4.9	—
	Value of imports	601	745	—	24.0	—
2342	Bras, girdles, and allied garments					
	Value of exports	165	172	—	4.2	—
	Value of imports	327	346	—	5.8	—
2361	Girls' & children's dresses, blouses					
	Value of exports	0.0	0.0	—	—	—
	Value of imports	0.0	0.0	—	—	—
2369	Girls' and children's outerwear, nec					
	Value of exports	20.9	33.5	—	60.3	—
	Value of imports	81.1	102	—	25.8	—
239A	Textile Housefurnishings					
	Value of exports	202	234	—	15.8	—
	Value of imports	922	996	—	8.0	—
239B	Misc. Textile Products					
	Value of exports	316	367	—	16.1	—
	Value of imports	933	1,219	—	30.7	—
Selected Apparel						
	Value of exports	1,888	2,249	—	19.1	—
	Value of imports	16,111	17,547	—	8.9	—

[1] Estimate.

[2] Forecast.

SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA). Estimates and forecasts by ITA.

Apparel manufacturing remains a highly labor intensive industry, with 84 percent of the work force in production jobs, compared with 68 percent for all manufacturing. Hourly wages average only about two-thirds the national average for non-agricultural employment. Compared with other manufacturing industries, the apparel industry employs more women and minorities. Women made up 77 percent of the apparel workforce in 1989, compared with 33 percent for total manufacturing. Minority workers had about double the representation in apparel as in manufacturing as a whole.

Spurred by the challenges of stiff competition and the diverse and changing demands of the American consumer, the U.S. apparel industry has undergone a marked transformation during the past decade. One response to the new market environment has been a heightened emphasis on technological improvements. Many labor-intensive operations are being automated. Innovations include multiple work stations, in which a machine performs more than one process or an operator controls two or more machines; and computer-controlled pattern making, spreading, marking, and cutting machines, which in addition to saving labor can also reduce material usage.

The industry recognizes, however, that apparel manufacturing remains labor intensive and that the competitive benefits of improved production technology are not a panacea. Consequently, the industry has become committed to the concept of Quick Response (QR) to capitalize on the advantages of being closer to its customers both physically and from the standpoint of understanding their preferences and tastes. QR involves expediting feedback of marketing information from consumers to manufacturers, thereby shortening production and reorder times and heightening responsiveness to fashion changes. At the heart of this strategy is electronic data interchange, notably bar coding and shipping container marking, which facilitates rapid communication with fabric and trim suppliers and with retailers.

According to a recent private study, the number of textile and apparel companies implementing QR increased by a significant 20 percent during the previous two years. In an industry where fashion changes can occur overnight and inventory mismanagement can be disastrous, QR is spreading even though the considerable investment involved may not be recovered for some time. This means that the larger and stronger apparel companies are more apt to take advantage of this strategy. However, the report noted that smaller firms are increasingly becoming involved also, and many have ambitious programs planned for the next five years.

INTERNATIONAL COMPETITIVENESS

The trend toward internationalization of the apparel market will likely continue at a rapid pace. Several factors will sustain this development, including EC92, the emergence of market-oriented economies in Eastern Europe, and the likelihood of further hemispheric economic integration through the prospective U.S.-Mexico free trade agreement and other proposals for an open North American trading area.

With the U.S. market softening in 1990, imports of apparel were also relatively slow. Various upward pressures

Trends and Forecasts: Selected Men's and Boys' Apparel (SIC 231, 2321, -3, -5, -6)

(in millions of dollars except as noted)

Item	1987	1988[1]	1989[2]	1990[2]	Percent Change 1987-88	1988-89	1989-90
Industry Data							
Value of shipments[3]	14,969	15,101	15,468	15,288	0.9	2.4	-1.2
2311 Men/boys' suits/coats	2,863	3,169	3,102	3,137	10.7	-2.1	1.1
2321 Men's and boys' shirts	4,075	4,031	4,170	4,101	-1.1	3.4	-1.7
2323 Men's & boys' neckwear	476	500	502	501	5.0	0.4	-0.2
2325 Men/boys' trousers	6,014	5,767	6,061	5,915	-4.1	5.1	-2.4
2326 Men/boys' work clothing	1,542	1,633	1,633	1,634	5.9	0.0	0.1
Value of shipments (1987$)	14,969	14,511	14,592	13,895	-3.1	0.6	-4.8
2311 Men/boys' suits/coats	2,863	3,015	2,910	2,829	5.3	-3.5	-2.8
2321 Men's and boys' shirts	4,075	3,878	3,936	3,731	-4.8	1.5	-5.2
2323 Men's & boys' neckwear	476	491	479	463	3.2	-2.4	-3.3
2325 Men/boys' trousers	6,014	5,560	5,728	5,389	-7.5	3.0	-5.9
2326 Men/boys' work clothing	1,542	1,567	1,539	1,483	1.6	-1.8	-3.6
Total employment (000)	266	270	261	245	1.5	-3.3	-6.1
2311 Men/boys' suits/coats	55.2	60.0	58.2	51.9	8.7	-3.0	-10.8
2321 Men's and boys' shirts	76.7	77.4	74.1	69.4	0.9	-4.3	-6.3
2323 Men's & boys' neckwear	7.4	7.5	7.5	7.6	1.4	0.0	1.3
2325 Men/boys' trousers	93.3	91.9	89.6	86.0	-1.5	-2.5	-4.0
2326 Men/boys' work clothing	33.0	33.3	31.5	30.2	0.9	-5.4	-4.1
Production workers (000)	232	236	227	212	1.7	-3.8	-6.6
2311 Men/boys' suits/coats	48.1	51.7	48.2	42.2	7.5	-6.8	-12.4
2321 Men's and boys' shirts	66.6	68.0	65.6	61.3	2.1	-3.5	-6.6
2323 Men's & boys' neckwear	6.2	6.2	6.2	6.2	0.0	0.0	0.0
2325 Men/boys' trousers	82.3	80.8	78.8	75.6	-1.8	-2.5	-4.1
2326 Men/boys' work clothing	29.0	29.5	28.1	26.8	1.7	-4.7	-4.6
Average hourly earnings ($)	5.92	6.19	—	—	4.6	—	—
2311 Men/boys' suits/coats	6.95	7.10	7.39	7.69	2.2	4.1	4.1
2321 Men's and boys' shirts	5.45	5.78	6.02	6.38	6.1	4.2	6.0
2323 Men's & boys' neckwear	6.98	7.22	7.31	7.38	3.4	1.2	1.0
2325 Men/boys' trousers	5.88	6.26	6.42	6.65	6.5	2.6	3.6
2326 Men/boys' work clothing	5.17	5.18	5.34	5.64	0.2	3.1	5.6
Capital expenditures	176	163	—	—	-7.4	—	—
2311 Men/boys' suits/coats	29.1	28.5	—	—	-2.1	—	—
2321 Men's and boys' shirts	51.7	53.3	—	—	3.1	—	—
2323 Men's & boys' neckwear	6.2	4.2	—	—	-32.3	—	—
2325 Men/boys' trousers	74.5	59.3	—	—	-20.4	—	—
2326 Men/boys' work clothing	14.3	17.7	—	—	23.8	—	—
Product Data							
Value of shipments[4]	14,035	14,174	14,456	14,299	1.0	2.0	-1.1
2311 Men/boys' suits/coats	2,877	2,977	3,000	2,985	3.5	0.8	-0.5
2321 Men's and boys' shirts	3,842	3,728	3,661	3,799	-3.0	4.1	-2.1
2323 Men's & boys' neckwear	422	457	450	453	8.3	-1.5	0.7
2325 Men/boys' trousers	5,474	5,475	5,612	5,537	0.0	2.5	-1.3
2326 Men/boys' work clothing	1,420	1,537	1,515	1,525	8.2	-1.4	0.7
Value of shipments (1987$)	14,035	13,623	13,644	13,002	-2.9	0.2	-4.7
2311 Men/boys' suits/coats	2,877	2,835	2,818	2,696	-1.5	-0.6	-4.3
2321 Men's and boys' shirts	3,842	3,586	3,664	3,457	-6.7	2.2	-5.6
2323 Men's & boys' neckwear	422	448	429	418	6.2	-4.2	-2.6
2325 Men/boys' trousers	5,474	5,278	5,304	5,046	-3.6	0.5	-4.9
2326 Men/boys' work clothing	1,420	1,476	1,429	1,385	3.9	-3.2	-3.1

[1] Advance data from the 1988 Annual Survey of Manufactures.

[2] Estimate.

[3] Value of all products and services sold by establishments in the selected men's & boys' apparel industry.

[4] Value of products classified in the selected men's & boys' apparel industry produced by all industries.

SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA). Estimates and forecasts by ITA.

Trends and Forecasts: Men's and Boys' Underwear and Nightwear (SIC 2322)

(in millions of dollars except as noted)

Item	1987	1988[1]	1989[2]	1990[2]	Percent Change 1987-88	1988-89	1989-90
Industry Data							
Value of shipments[3]	1,045	1,045	1,075	1,060	0.0	2.9	-1.4
Value of shipments (1987$)	1,045	1,014	1,019	971	-3.0	0.5	-4.7
Total employment (000)	17.2	17.1	18.9	20.0	-0.6	10.5	5.8
Production workers (000)	16.2	16.1	18.2	19.6	-0.6	13.0	7.7
Average hourly earnings ($)	5.98	6.22	6.28	6.42	4.0	1.0	2.2
Capital expenditures	7.6	11.6	—	—	52.6	—	—
Product Data							
Value of shipments[4]	997	1,001	1,024	1,011	0.4	2.3	-1.3
Value of shipments (1987$)	997	972	971	927	-2.5	-0.1	-4.5

[1] Advance data from the 1988 Annual Survey of Manufactures.

[2] Estimate.

[3] Value of all products and services sold by establishments in the men's & boys' underwear + nightwear industry.

[4] Value of products classified in the men's & boys' underwear + nightwear industry produced by all industries.

SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA). Estimates and forecasts by ITA.

Trends and Forecasts: Selected Women's Outerwear (SIC 2331, 2335, 2337)

(in millions of dollars except as noted)

Item	1987	1988[1]	1989[2]	1990[2]	Percent Change 1987-88	1988-89	1989-90
Industry Data							
Value of shipments[3]	13.465	14.315	14.288	14.307	6.3	−0.2	0.1
2331 Women's/misses' blouses	3.831	3.573	3.810	3.691	−6.7	6.6	−3.1
2335 Women's/misses' dresses	5.188	6.037	5.771	5.908	16.4	−4.4	2.4
2337 Women's suits & coats	4.447	4.705	4.707	4.708	5.8	0.0	0.0
Value of shipments (1987$)	13.465	13.813	13.506	13.043	2.6	−2.2	−3.4
2331 Women's/misses' blouses	3.831	3.501	3.629	3.404	−8.6	3.7	−6.2
2335 Women's/misses' dresses	5.188	5.846	5.465	5.400	12.7	−6.5	−1.2
2337 Women's suits & coats	4.447	4.466	4.412	4.239	0.4	−1.2	−3.9
Total employment (000)	241	235	231	218	−2.5	−1.7	−5.6
2331 Women's/misses' blouses	73.4	67.0	64.6	58.8	−8.7	−3.6	−9.0
2335 Women's/misses' dresses	113	115	112	105	1.8	−2.6	−6.3
2337 Women's suits & coats	56.2	53.3	54.5	54.0	−3.4	2.3	−0.9
Production workers (000)	199	191	188	175	−4.0	−1.6	−6.9
2331 Women's/misses' blouses	63.2	56.7	54.8	49.2	−10.3	−3.4	−10.2
2335 Women's/misses' dresses	91.5	91.8	89.5	83.1	0.3	−2.5	−7.2
2337 Women's suits & coats	44.6	42.2	43.7	42.9	−5.4	3.6	−1.8
Average hourly earnings ($)	5.95	6.20	—	—	4.2	—	—
2331 Women's/misses' blouses	5.38	5.65	5.85	6.11	5.0	3.5	4.4
2335 Women's/misses' dresses	6.08	6.40	6.69	6.80	5.3	4.5	1.6
2337 Women's suits & coats	6.53	6.57	6.53	7.02	0.6	−0.6	7.5
Capital expenditures	96.0	119	—	—	24.0	—	—
2331 Women's/misses' blouses	40.1	46.0	—	—	14.7	—	—
2335 Women's/misses' dresses	31.4	23.8	—	—	−24.2	—	—
2337 Women's suits & coats	24.5	49.0	—	—	100.0	—	—
Product Data							
Value of shipments[4]	13.410	13.927	14.012	13.953	3.9	0.6	−0.4
2331 Women's/misses' blouses	4.178	3.983	4.184	4.078	−4.7	5.0	−2.5
2335 Women's/misses' dresses	5.347	5.810	5.718	5.758	8.7	−1.6	0.7
2337 Women's suits & coats	3.885	4.134	4.110	4.117	6.4	−0.6	0.2
Value of shipments (1987$)	13.410	13.453	13.255	12.735	0.3	−1.5	−3.9
2331 Women's/misses' blouses	4.178	3.889	3.979	3.752	−6.9	2.3	−5.7
2335 Women's/misses' dresses	5.347	5.633	5.419	5.270	5.3	−3.8	−2.7
2337 Women's suits & coats	3.885	3.931	3.857	3.713	1.2	−1.9	−3.7

[1] Advance data from the 1988 Annual Survey of Manufactures.

[2] Estimate.

[3] Value of all products and services sold by establishments in the selected women's outerwear industry.

[4] Value of products classified in the selected women's outerwear industry produced by all industries.

SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA). Estimates and forecasts by ITA.

Trends and Forecasts: Women's and Children's Undergarments (SIC 234)

(in millions of dollars except as noted)

Item	1987	1988[1]	1989[2]	1990[2]	Percent Change 1987-88	1988-89	1989-90
Industry Data							
Value of shipments[3]	3.738	3.884	3.921	3.904	3.9	1.0	−0.4
2341 Women/child's underwear	2.658	2.621	2.716	2.669	−1.4	3.6	−1.7
2342 Bras & allied garments	1.080	1.263	1.205	1.235	16.9	−4.6	2.5
Value of shipments (1987$)	3.738	3.786	3.725	3.586	1.3	−1.6	−3.7
2341 Women/child's underwear	2.658	2.555	2.580	2.452	−3.9	1.0	−5.0
2342 Bras & allied garments	1.080	1.231	1.145	1.134	14.0	−7.0	−1.0
Total employment (000)	67.5	66.8	63.0	58.1	−1.0	−5.7	−7.8
2341 Women/child's underwear	53.7	53.9	50.4	46.4	0.4	−6.5	−7.9
2342 Bras & allied garments	13.8	12.9	12.6	11.7	−6.5	−2.3	−7.1
Production workers (000)	56.2	56.0	52.8	48.5	−0.4	−5.7	−8.1
2341 Women/child's underwear	46.5	46.7	43.7	40.3	0.4	−6.4	−7.8
2342 Bras & allied garments	9.7	9.3	9.1	8.2	−4.1	−2.2	−9.9
Average hourly earnings ($)	5.70	5.87	—	—	3.0	—	—
2341 Women/child's underwear	5.72	5.84	6.11	6.38	2.1	4.6	4.4
2342 Bras & allied garments	5.63	6.03	6.29	6.56	7.1	4.3	4.3
Capital expenditures	51.6	49.2	—	—	−4.7	—	—
2341 Women/child's underwear	44.9	36.0	—	—	−19.8	—	—
2342 Bras & allied garments	6.7	13.2	—	—	97.0	—	—
Product Data							
Value of shipments[4]	3.574	3.644	3.699	3.667	2.0	1.5	−0.9
2341 Women/child's underwear	2.591	2.513	2.616	2.561	−3.0	4.1	−2.1
2342 Bras & allied garments	983	1.131	1.083	1.106	15.1	−4.2	2.1
Value of shipments (1987$)	3.575	3.540	3.510	3.361	−1.0	−0.8	−4.2
2341 Women/child's underwear	2.591	2.446	2.485	2.351	−5.6	1.6	−5.4
2342 Bras & allied garments	983	1.094	1.025	1.010	11.3	−6.3	−1.5

[1] Advance data from the 1988 Annual Survey of Manufactures.

[2] Estimate.

[3] Value of all products and services sold by establishments in the women's and children's undergarments industry.

[4] Value of products classified in the women's and children's undergarments industry produced by all industries.

SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA). Estimates and forecasts by ITA.

Trends and Forecasts: Girls' and Children's Outerwear (SIC 236)

(in millions of dollars except as noted)

Item	1987	1988[1]	1989[2]	1990[2]	Percent Change 1987-88	Percent Change 1988-89	Percent Change 1989-90
Industry Data							
Value of shipments[3]	3,753	3,673	3,821	3,786	−2.1	4.0	−0.9
2361 Child's dresses/blouses	1,519	1,604	1,606	1,622	5.6	0.1	1.0
2369 Childrens outerwear nec	2,235	2,070	2,215	2,164	−7.4	7.0	−2.3
Value of shipments (1987$)	3,753	3,632	3,656	—	−3.2	0.7	—
2361 Child's dresses/blouses	1,519	1,569	1,529	1,546	3.3	−2.5	1.1
2369 Childrens outerwear nec	2,235	2,063	2,127	—	−7.7	3.1	—
Total employment (000)	71.7	68.9	68.2	66.3	−3.9	−1.0	−2.8
2361 Child's dresses/blouses	30.9	28.9	28.5	27.5	−6.5	−1.4	−3.5
2369 Childrens outerwear nec	40.8	40.0	39.7	38.8	−2.0	−0.8	−2.3
Production workers (000)	60.9	57.6	56.6	55.3	−5.4	−1.7	−2.3
2361 Child's dresses/blouses	26.2	23.7	23.2	22.5	−9.5	−2.1	−3.0
2369 Childrens outerwear nec	34.7	33.9	33.4	32.8	−2.3	−1.5	−1.8
Average hourly earnings ($)	5.70	5.55	—	—	−2.6	—	—
2361 Child's dresses/blouses	5.71	5.70	5.92	6.07	−0.2	3.9	2.5
2369 Childrens outerwear nec	5.69	5.45	5.64	5.89	−4.2	3.5	4.4
Capital expenditures	34.7	30.5	—	—	−12.1	—	—
2361 Child's dresses/blouses	12.6	12.5	—	—	−0.8	—	—
2369 Childrens outerwear nec	22.1	18.0	—	—	−18.6	—	—
Product Data							
Value of shipments[4]	3,567	3,532	3,641	3,623	−1.0	3.1	−0.5
2361 Child's dresses/blouses	1,608	1,622	1,656	1,655	0.9	2.1	−0.1
2369 Childrens outerwear nec	1,960	1,912	1,985	1,968	−2.4	3.8	−0.9
Value of shipments (1987$)	3,567	3,484	3,479	3,475	−2.3	−0.1	−0.1
2361 Child's dresses/blouses	1,608	1,579	1,572	1,573	−1.8	−0.4	0.1
2369 Childrens outerwear nec	1,960	1,905	1,907	1,902	−2.8	0.1	−0.3

[1] Advance data from the 1988 Annual Survey of Manufactures.

[2] Estimate.

[3] Value of all products and services sold by establishments in the girls' and children's outerwear industry.

[4] Value of products classified in the girls' and children's outerwear industry produced by all industries.

SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA). Estimates and forecasts by ITA.

Trends and Forecasts: Miscellaneous Fabricated Textile Products (SIC 239)

(in millions of dollars except as noted)

Item	1987	1988[1]	1989[2]	1990[2]	Percent Change 1987-88	Percent Change 1988-89	Percent Change 1989-90
Industry Data							
Value of shipments[3]	15,812	15,832	16,279	16,060	0.1	2.8	−1.3
239A Homefurnishings	6,070	6,122	6,271	6,198	0.9	2.4	−1.2
239B Misc. textile products	9,742	9,710	10,008	9,862	−0.3	3.1	−1.5
Value of shipments (1987$)	15,812	15,461	15,482	14,773	−2.2	0.1	−4.6
239A Homefurnishings	6,070	5,955	5,953	5,685	−1.9	0.0	−4.5
239B Misc. textile products	9,742	9,506	9,529	9,088	−2.4	0.2	−4.6
Total employment (000)	199	198	203	204	−0.4	2.4	0.9
239A Homefurnishings	77.6	76.8	81.6	81.4	−1.0	6.2	−0.2
239B Misc. textile products	121	121	121	123	0.0	0.0	1.7
Production workers (000)	162	161	167	166	−0.5	4.0	−1.1
239A Homefurnishings	64.2	63.6	67.4	66.6	−0.9	6.0	−1.2
239B Misc. textile products	97.5	97.3	100	99	−0.2	2.8	−1.0
Average hourly earnings ($)	7.28	7.63	7.89	8.09	4.8	3.4	2.5
239A Homefurnishings	6.08	6.17	6.42	6.63	1.5	4.1	3.3
239B Misc. textile products	8.09	8.59	8.96	9.27	6.2	4.3	3.5
Capital expenditures	252	191	—	—	−24.4	—	—
239A Homefurnishings	59.1	56.7	—	—	−4.1	—	—
239B Misc. textile products	193	134	—	—	−30.6	—	—
Product Data							
Value of shipments[4]	15,131	15,261	15,578	15,401	0.9	2.1	−1.1
239A Homefurnishings	5,824	5,932	6,026	5,972	1.9	1.6	−0.9
239B Misc. textile products	9,307	9,329	9,552	9,429	0.2	2.4	−1.3
Value of shipments (1987$)	15,131	14,930	14,831	14,190	−1.3	−0.7	−4.3
239A Homefurnishings	5,824	5,786	5,728	5,489	−0.7	−1.0	−4.2
239B Misc. textile products	9,307	9,144	9,103	8,701	−1.8	−0.4	−4.4

[1] Advance data from the 1988 Annual Survey of Manufactures.

[2] Estimate.

[3] Value of all products and services sold by establishments in the misc. fabricated textile products industry.

[4] Value of products classified in the misc. fabricated textile products industry produced by all industries.

SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA). Estimates and forecasts by ITA.

Management Horizons

Projected demographic trends for the future indicate favorable demand for the apparel industry through the end of this century and into the first decade of the next.

on prices of imports pushed the value up by more than 10 percent, but in terms of quantity, apparel imports rose barely 2 percent. Exports were buoyant in 1990, rising in value by 21 percent, twice as fast as imports. But despite this favorable growth rate differential, the apparel trade deficit widened substantially, from $20.5 billion in 1989 to $22.5 billion in 1990.

Two political issues with important implications for the U.S. apparel industry were dominant in 1990. The first was passage of the Textile and Apparel Trade Act of 1990, often referred to as "The Textile Bill," its subsequent veto by the President, and the failure of the House of Representative to override the veto. The second issue was the Uruguay Round negotiations under the General Agreement on Tariffs and Trade (GATT) to modify the existing international trading system in textile products. The objective, as outlined in the Punta Del Este agreement, is to consider options that would permit eventual integration of this trade to normal GATT rules.

Import competition in apparel comes largely from the developing countries of Asia, although there has been significant growth in recent years from Mexico and the Caribbean countries. Asian countries, particularly China, have a formidable competitive advantage in apparel, thanks mainly to their abundant supply of relatively low-cost labor. In 1990, three Asian countries—China, Hong Kong, and the Philippines—accounted for approximately half of the growth in the value of imports, while a significant gain was also recorded for Mexico.

A substantial portion of the growth in U.S. exports of apparel in recent years has reflected greater shipments of apparel parts to Mexico, Central America, and the Caribbean under the tariff provision 9802 (formerly 807). The provision allows these products to be finished abroad and reimported into the U.S. market with duty charged only on the foreign value added. However, substantial gains were also recorded in exports to other markets. Sales to Canada doubled in value to nearly $350 million, and exports to Japan (the second largest market when countries involved primarily in 9802 trade are excluded) increased by more than one-third.

Long-Term Prospects

The future holds promising opportunities for the U.S. apparel industry. However, domestic and international competition will be no less intense than in the past. To succeed, companies will need to be even more closely attuned to changes in the marketplace and be capable of adapting to them. U.S. firms now have a genuine opportunity to take advantage of foreign market growth and the progress that has been made in eliminating trade barriers abroad.

Projected future demographic trends indicate a favorable demand picture for the apparel industry through the end of this century and into the first decade of the next. By far the fastest growing group in the population will be the over-45 age category as the baby boomers enter middle age. This group is at its peak spending capability and will represent a strong market for many types of apparel, including career clothing, active wear, and casual and informal attire. Manufacturers best attuned to the needs and tastes of this population segment will capture the greatest rewards.—*Kent Barker, Office of Textiles and Apparel, (202) 377-4058, November 1990.*

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Leather and Leather Products

Industry shipments of leather and leather products increased less than 1 percent in 1990 to an estimated $9.28 billion from $9.26 billion in 1989. Their constant (1987) dollar value declined about 4.6 percent but is expected to increase about 1 percent in 1991 as exports for one segment, leather tanning, increase substantially.

The leather products group includes seven industries: nonrubber footwear (SIC 314); leather tanning and finishing (SIC 311); gloves and mittens (SIC 3151); luggage (SIC 3161); handbags (SIC 3171); small personal leather goods (SIC 3172); and leather wearing apparel (SIC 2386).

Before reading this chapter, please see "How to Get the Most Out of This Book" one page one. It will clarify questions you may have concerning data collection procedures, factors affecting trade data, forecasting methodology, the use of constant dollars, the difference between industry and product data, sources and references, and the Standard Industrial Classification system (SIC). For other topics related to the subject of this chapter, see chapter(s) 9 (Textile Mill Products; 12 (Chemicals and Allied Products); 13 (Industrial and Agricultural Chemicals); 14 (Plastics and Rubber); and 34 (Apparel).

Table 1: Distribution of Leather and Leather Products, 1990

(in billions of current dollars)

Industry	Shipments	Percent of Total
Nonrubber footwear	4.07	43.8
Leather tanning and finishing	2.76	29.7
Luggage	1.06	11.4
Handbags	.50	5.4
Small personal leather goods	.46	5.0
Leather wearing apparel	.22	2.4
Gloves and mittens	.21	2.3
TOTAL	9.28	100.0

SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration

The distribution of 1990 current-dollar industry shipments is shown in Table 1. Table 2 compares constant-dollar rates of change for shipments of leather and leather products in 1990 and 1991. The entire industry is expected to experience an increase of 1.1 percent in 1991, with increases for 3 specific sectors ranging from 9.4 percent for leather tanning to 0.5 percent for small personal leather goods. Constant-dollar shipments for each of the remaining 4-digit industries are expected to decline.

Table 2: Industry Shipments of Leather and Leather Products 1990–91

(in millions of 1987 dollars except as noted)

SIC	Industry	1990[1]	Percent change 1989-90	1991[2]	Percent change 1990-91
3111	Leather tanning and finishing	2,229	4.7	2,439	9.4
3142	House slippers	195	−15.7	187	−4.0
3143	Men's footwear, except athletic	1,669	−13.6	1,603	−4.0
3144	Women's footwear, except athletic	1,137	−7.1	1,103	−3.0
3149	Footwear, except rubber, n.e.c.	508	−3.9	518	2.0
3151	Leather gloves and mittens	172	−1.8	170	−1.0
3161	Luggage	911	−1.9	902	−1.0
3171	Handbags and purses	453	−9.6	440	−3.0
3172	Small personal leather goods	401	0.9	403	0.5
2386	Leather and sheeplined clothing	193	−2.9	186	−4.0
	Total	7,868	−4.6	7,951	1.1

[1] Estimate

[2] Forecast

SOURCE: U.S. Department of Commerce, International Trade Administration

In 1990, total employment in these 7 industries was 111,4000, down 4.9 percent from 1989. With the exception of leather tanning and finishing, all of these industries are extremely labor intensive. In comparison with U.S. producers, manufacturers in many developing countries maintain a substantial cost advantage due to their much lower labor rates.

INTERNATIONAL COMPETITIVENESS

U.S. imports of these products rose about 13 percent in 1990 to an estimated $13.18 billion, with developing and newly industrialized countries, such as Korea and Taiwan, accounting for 82 percent of the total. By comparison, U.S. exports of leather, nonrubber footwear, and leather products were about $1.34 billion, up 39 percent from 1989. Thus, leather and leather products imports exceeded exports by about $11.8 billion, with $8.2 billion of the deficit in nonrubber footwear. The ratio of imports to new supply averaged about 60 percent (by value) for all leather and leather products. The leather wearing apparel industry had the highest ratio, 88 percent, followed by 69 percent for footwear, 64 percent for handbags and 56 percent for luggage.—*James E. Byron, Office of Consumer Goods, (202) 377-4034, September 1990.*

LEATHER TANNING AND FINISHING

Leather tanning and finishing industry shipments rose about 10 percent in 1990 to $2.76 billion, a 5-percent increase in constant dollars. Product shipments also climbed 10 percent to $2.69 billion, 5-percent in constant dollars.

The quantity of leather shipped in 1990 increased about 5 percent to an estimated 13.9 million cattlehide equivalents. These include equivalent leathers produced from the hides or

U.S. Exports and Imports
Leather and Leather Products
(in millions of dollars except as noted)

SIC	Industry	1989	1990[1]	1991[2]	Percent Change 1989-90	Percent Change 1990-91
2386	Leather and sheep-lined clothing					
	Value of exports	45.8	54.0	—	17.9	—
	Value of imports	1,173	1,462	—	24.6	—
3111	Leather tanning and finishing					
	Value of exports	625	875	—	40.0	—
	Value of imports	744	715	—	−3.9	—
314	Nonrubber footwear					
	Value of exports	179	270	—	50.8	—
	Value of imports	7,440	8,500	—	14.2	—
3151	Leather gloves and mittens					
	Value of exports	11.5	14.3	—	24.3	—
	Value of imports	170	179	—	5.3	—
3161	Luggage					
	Value of exports	66.1	82.5	—	24.8	—
	Value of imports	995	1,220	—	22.6	—
3171	Women's handbags and purses					
	Value of exports	25.4	24.5	—	−3.5	—
	Value of imports	836	854	—	1.9	—
3172	Personal leather goods, nec					
	Value of exports	13.3	20.9	—	57.1	—
	Value of imports	258	253.2	—	−1.9	—
	Leather and Leather Products					
	Value of exports	966	1,341	—	38.8	—
	Value of imports	11,618	13,183	—	13.5	—

[1] Estimate.

[2] Forecast.

SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA). Estimates and forecasts by ITA.

U.S. Trade Patterns in 1989
Leather and Leather Products
SIC 2386, 311, 314, 315, 316, 317
(in millions of dollars, percent)

Exports	Value	Share	Imports	Value	Share
Canada & Mexico	188	19.5	Canada & Mexico	252	2.2
South America	43.6	4.5	South America	1,402	12.1
European Community	116	12.0	European Community	637	5.5
East Asia NICs	190	19.7	East Asia NICs	7,472	64.3
Japan	173	17.9	Japan	27.5	0.2
Other	304	31.4	Other	1,928	16.7
World Total	966	100.0	World Total	11,618	100.0

Top Five Countries

	Value	Share		Value	Share
Japan	173	17.9	South Korea	3,319	28.6
Italy	105	10.9	Taiwan	2,370	20.4
Canada	103	10.7	China	1,242	10.7
Mexico	84.5	8.7	Italy	1,115	9.6
South Korea	67.8	7.0	Brazil	1,052	9.1

See "How to Get the Most Out of This Book" for definitions of the Country Groupings.

SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA).

skins of cattle, calf, kip, goat, sheep, lamb, cabretta, pig, horse, and other animals and reptiles converted to a cattlehide basis. Cattlehide leather accounted for 87 percent of the total or 12.1 million units.

The leather tanning and finishing industry is composed of establishments primarily engaged in tanning, currying, and finishing raw or cured hides and skins into leather. The industry also includes leather converters and dealers who buy hides and skins and contract with tanners or finishers to process these products. In 1987, the value of such contract shipments was $159.5 million, or 7 percent of total product shipments.

The tanning industry has undergone considerable contraction and consolidation in recent years. In 1987, there were 311 companies operating 344 establishments, down from 342 and 384, respectively, in 1982. The states with the largest number of establishments were New York, Massachusetts, California, Wisconsin, Pennsylvania, New Jersey, and Texas. By 1990, only about 125 establishments of significant size were directly tanning raw hides and skins into leather. Industry employment in 1990 was an estimated 16,200, up about 2 percent from 1989. Production employment was 13,500, up about 1.5 percent. Average hourly earnings for production workers in 1990 were $9.66, up 3 percent from 1989.

The shoe industry consumed about 50 percent of domestic leather shipments in 1990. Fifty-five percent of all nonrubber footwear produced domestically is made with leather uppers. Higher leather prices had little effect in reducing the proportion of footwear with leather uppers in both domestic and imported nonrubber footwear. Heavier weight, oiled, or waxy water-resistant leathers for moccasins, boat shoes, and boots were much in demand. In 1990, shipments of sole leather remained unchanged and captured only 7 percent of domestic leather shipments. Domestic shoe manufacturers continue to substitute cheaper synthetic materials for sole leather. These substitutes have been made even more

Trends and Forecasts: Leather Tanning and Finishing (SIC 3111)
(in millions of dollars except as noted)

Item	1987	1988[1]	1989[2]	1990[2]	1991[3]	Percent Change 1987-88	Percent Change 1988-89	Percent Change 1989-90	Percent Change 1990-91
Industry Data									
Value of shipments[4]	2,219	2,488	2,500	2,760	—	12.1	0.5	10.4	—
Value of shipments (1987$)	2,219	2,155	2,128	2,229	2,439	−2.9	−1.3	4.7	9.4
Total employment (000)	14.6	15.1	15.9	16.2	—	3.4	5.3	1.9	—
Production workers (000)	12.1	12.5	13.3	13.5	—	3.3	6.4	1.5	—
Average hourly earnings ($)	8.61	9.06	9.40	9.66	—	5.2	3.8	2.8	—
Capital expenditures	27.7	28.6	—	—	—	3.2	—	—	—
Product Data									
Value of shipments[5]	2,212	2,425	2,437	2,691	—	9.6	0.5	10.4	—
Value of shipments (1987$)	2,212	2,089	2,071	2,168	2,372	−5.6	−0.9	4.7	9.4
Quantity shipped (Million Equiv. Hides)	14.9	13.3	13.2	13.9	15.2	−10.7	−0.8	5.3	9.4

[1] Advance data from the 1988 Annual Survey of Manufactures.

[2] Estimate.

[3] Forecast.

[4] Value of all products and services sold by establishments in the leather tanning and finishing industry.

[5] Value of products classified in the leather tanning and finishing industry produced by all industries.

SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA). Estimates and forecasts by ITA.

competitive than sole leather by new equipment and technology that reduce labor costs in shoe-bottoming operations. Cattlehide and sheep and lambskin garment leather shipments were steady at 17 percent of domestic leather shipments.

The fastest growing and potentially largest markets for leather in the United States are those for automotive and furniture upholstery leather. In 1987, upholstery leather shipments represented 21 percent, by value, of all leather product shipments, up from 7 percent in 1982. Almost 20 percent of furniture manufactured in the United States is upholstered with leather. Leather is available as an option in most medium-priced automobiles and is a standard interior in high-priced foreign and domestic models. U.S. upholstery leather exports, particularly to Japan, continued to grow substantially in 1990. Japanese models made in the United States also featured domestically made upholstery leather. Production of wet-blue (semiprocessed, chrome-tanned) cattlehide leather by both packers and tanners increased sharply.

Hide Supply and Prices

The quantity of cattlehides derived from total commercial slaughter declined about 1.5 percent in 1990 to an estimated 33.4 million hides. Cattle slaughter reached a high of 43 million head in 1976 and has been in a long-term decline ever since.

Cattlehides are a by-product of the meat-packing industry, and their supply depends solely on demand for meat. A long-term downward shift in demand for red meat has discouraged rebuilding of cattle herds despite favorable prices for feed grains since 1986. As a result, cattle slaughter continued to decline in 1990, although the rate of decline has moderated considerably since 1988.

Cattle inventory increased slightly to 99.3 million head on January 1, 1990, from 99.2 million on January 1, 1989. Higher cattle prices in 1990 gave growers an incentive to withhold breeding stock from the market, thereby reducing the cow kill. This reduction is expected to result in a larger calf crop in 1991 and a small increase in cattle inventory to 101 million head. Cattle slaughter is expected to increase slightly to about 33.8 million head in 1991. Consequently, cattlehide supplies will remain tight, although hide and leather prices could drop slightly.

In 1990, cattlehide prices increased an estimated 4 percent over 1989. During January–August 1990, Department of Commerce composite average monthly price of 3 types of hides was 94 cents per pound, up 10.5 percent from the same period in 1989. The Bureau of Labor Statistics' commodity index for cattlehides for the same period was also up about 7 percent from the previous year. For January–August 1990, the Producer Price Index (PPI) for all leather increased about 5.5 percent from the same period in 1989. Hide prices weakened somewhat in the third quarter of 1990, but were expected to remain stable in the fourth quarter. Although slaughter will increase slightly in 1991, hide prices will remain firm as domestic demand also increases.

Cattlehide Exports

Combine exports of raw and wet-blue cattlehides totaled an estimated 27.1 million hides in 1990, down about 2 percent from 1989 (Figure 1). Expressed as a percentage of total commercial slaughter, these exports by quantity decreased slightly in 1990 to 81 percent. Raw cattlehide exports declined about 11 percent in 1990 to an estimated 20.8 million pieces; wet-blue cattlehide exports increased a substantial 45 percent to an estimated 6.2 million pieces. During the first half of 1990, South Korea (48 percent; Japan (30 percent; Taiwan (6 percent; and Mexico (5 percent)—in that order—were the largest importers of U.S. cattlehides, and they took a combined 89 percent of the total.

Unlike many other countries with abundant hide supplies, the United States is the largest hide exporter. The high proportions of cattlehides exported by the United States in recent years have been the major cause of high domestic hide and leather prices. Developing countries—particularly those with abundant raw material supplies such as Argentina, Brazil, and India—impose export controls or taxes to restrict raw material exports in order to encourage the growth of their own tanning and leather products industries. Export restrictions depress the price of hides and skins within these countries, thereby indirectly subsidizing their production and exports of leather and leather products. Large quantities of these products come to the United States.

The United States produces about 4 million calfskins annually and exports almost all of them, primarily to South Korea, Japan, Taiwan, Italy, and Mexico. Because of limited supplies of imported raw materials, goat and kid leathers are no longer tanned in significant quantities in the United States. In 1990, about $5.8 million domestic sheepskins, supplemented by about 6 million imported pickled sheepskins, were tanned into grain and suede garment leathers and shearlings. Much of this leather was exported for manufacture of leather products in other countries.

Environmental Regulation

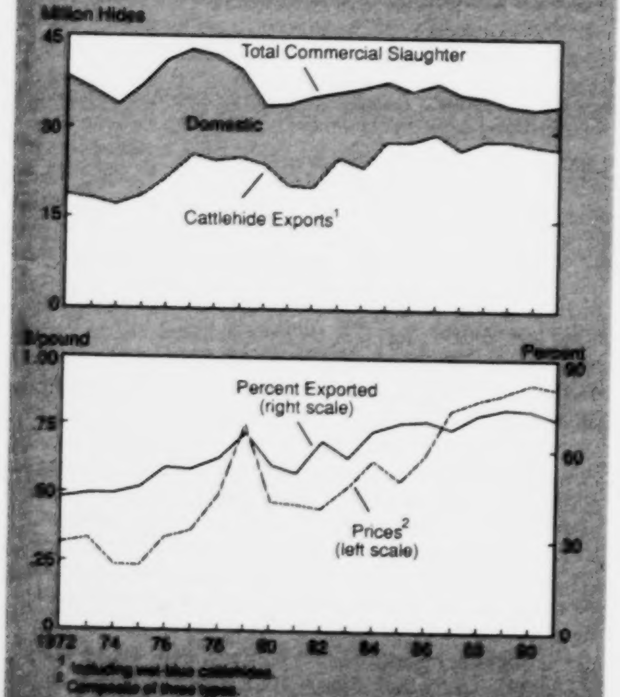
Environmental regulations affecting the leather tanning and finishing industry are administered by the Environmental Protection Agency (EPA). In 1985, EPA established new standards to control pretreatment of liquid wastes tanners discharge indirectly to publicly owned waste treatment facilities. These standards do not require biological treatment but do require control of sulfides, chromium, and acidity. Most tanners are coping successfully with these Federal standards. In some states, however, local restrictions and tighter standards have forced other tanners to close altogether or confine production to the processing of wet-blue or crust leathers.

All tanners discharging directly to waterways, including those constructing new plants, must operate with EPA-approved National Discharge Elimination System permits. EPA standards for this group require control of conventional pollutants, such as solids and biological oxygen demand among others, in addition to sulfides, chrome, and acidity. Control of these wastes requires both primary and secondary (biological) treatment facilities. They may require very expensive tertiary treatment in the future if EPA tightens the standards or broadens them to include other pollutants.

The tanning industry has 4 primary areas of regulatory concern for the future. First, EPA is expected to implement second-generation discharge standards for industrial and municipal effluent to reduce or eliminate all identified toxic components. These may include ammonia, salt, biocides, and surfactants not currently regulated at the Federal level.

Control of these parameters can most likely be achieved through process modifications. Second, EPA may abolish the exclusion from Federal hazardous waste regulation of chromium-containing solid waste materials, such as waste scrap leather, wet-blue trimmings and shavings, and tannery sludges, because in land disposal this trivalent chromium waste might be oxidized to the more toxic hexavalent form. The majority of chromium-containing solid waste would then be classified as hazardous and require treatment prior to land disposal. The industry is developing and adopting new tanning systems that will use other nontoxic metal salts or combinations thereof to replace some or all of the chromium currently used. Third, strict Federal standards are likely to be established that curb emissions of volatile organic compounds resulting from tannery finishing operations. Consequently, the industry is adopting low-solvent or solvent-free finishing technology. Finally, the industry's use of chemicals that are potentially toxic or hazardous may focus public attention on workplace and consumer exposure to tanning chemicals, biocides, dyestuffs, and solvents. Although the use of leather has not been associated with such hazards, the industry believes that it could face enormous difficulties and costs in proving otherwise.

Figure 35-1
Cattlehides: U.S. Production, Exports and Prices



[1] Including wet-blue cattlehides.

[2] Composite of three types.

Source: U.S. Department of Agriculture; U.S. Department of Commerce, Bureau of the Census, and International Trade Administration.

INTERNATIONAL COMPETITIVENESS

Leather Exports

U.S. leather exports increased in 1990 by about 40 percent to $875 million. The weaker U.S. dollar coupled with strong economies in developed countries stimulated export demand.

The United States exported leather to about 70 countries during January–June 1990. Japan was the largest importer, accounting for 18 percent of all U.S. leather exports. Over 84 percent of Japanese imports from the United States were of automotive upholstery leather, which is exempt from the tariff-rate quota Japan imposes on other leather imports. South Korea, a leading exporter of leather footwear and garments to the United States, and Italy, were tied for second, each with a 14-percent share. Canada ranked fourth with 8 percent, followed by the Dominican Republic, 7.5 percent; Taiwan, 7 percent; West Germany, 4 percent; and Mexico, 4 percent. The European Community (EC) accounted for 22 percent.

In 1990, cattlehide leather accounted for an estimated 75 percent of all U.S. leather exports. Twenty-five percent, by value, of all leather exports was wet-blue cattlehide leather, including splits. Almost 50 percent of wet-blue exports went to Italy. South Korea and Taiwan were the next largest importers. Trade in wet-blue leather continues to increase because of lower shipping costs, quality advantages, and environmental benefits for these products compared with raw cattlehides. In response, the largest meat packer has expanded production capacity to almost 3.5 million hides annually to meet greater domestic and foreign demand for wet-blue leathers.

For January–June 1990, upholstery leather exports increased 29 percent over the same period in 1989 and accounted for 18 percent of all U.S. leather exports. The largest markets for U.S. upholstery leather were Japan (80 percent of the total) and West Germany (8 percent).

During the first 6 months of 1990, U.S. leather exports to beneficiary developing countries—countries that receive tariff concessions from the United States under the Generalized System of Preferences (GSP) section of the Trade Act of 1974—were 24 percent of total U.S. leather exports, down from 28 percent for the same period in 1989. Large increases were recorded for the Dominican Republic, Thailand, and Mexico.

Leather Imports

In 1990, U.S. leather imports declined about 4 percent to an estimated $715 million from $744 million in 1989. About 76 percent of this total was leather from bovine animals, 5 percent from sheep, 5 percent from goat, and 4 percent each from pigs and reptiles. Although U.S. imports, by value, of most other types of leather declined, those of upholstery leather increased about 30 percent to an estimated $85 million.

The United States imported leather from almost 70 countries in 1990, and Argentina was the largest supplier with about 24 percent of the total or an estimated $175 million. Italy was second with a 13-percent share, followed by the United Kingdom, 9 percent; Brazil and Canada, 5 percent each; and West Germany and India, 4 percent each. Argentina and Italy were the largest suppliers to the United States of cattlehide leather; the United Kingdom of sheep leather; and India of goat leather.

During January–June 1990, leather imports from EC countries accounted for 32 percent, by value, of total U.S. imports. The beneficiary developing countries' share of total imports for the 6-month period was 50 percent. Many developing countries have converted more of their domestic raw material supplies to leather and leather products for export markets. Because tanning capacity in these countries exceeds domestic supply, many also import hides and skins from the United States and other developed countries.

U.S.-Japan Trade Agreement

In January 1986, the United States reached an agreement to settle a long-standing dispute concerning Japan's import quotas on leather and leather footwear, which were found to be illegal under the General Agreement on Tariffs and Trade (GATT). Japan replaced these import quotas with GATT-legal tariff-rate quotas. The existing tariffs of 15–20 percent on leather and 27 percent on leather footwear now apply to quantities subject to quota, and a 60-percent rate applies to imports in excess of quota amounts. The agreement is scheduled to expire in March, 1991.

For January–June 1990, U.S. exports to Japan, by value, were up 136 percent over the same period in 1989 to $70 million. However, 83 percent of these exports or $58.1 million were automotive upholstery leather, which is not subject to the tariff-rate quotas because it is returned to the United States in Japanese automobiles. U.S. exports to Japan of leather other than upholstery increased from $6.9 million for January–June 1989 to $11.8 million for the same period in 1990.

Japan's bovine leather global quotas were 500,000 square meters in 1989, only about 1 percent of Japan's total bovine leather market. Almost all of the latter is produced from imported raw cattlehides. The United States supplied about 85 percent of these, or 7 million hides, in 1990.

Countervailing Duties

In February 1990, a group of U.S. tanners filed a petition with the Department of Commerce alleging that Argentina was providing, directly or indirectly, bounties, grants, and subsidies on leather exported to the United States within the meaning of section 303D of the Tariff Act of 1930, as amended. The petitioners listed a number of practices by the Government of Argentina which conferred bounties or grants on Argentine leather tanners. However, their main concern centered on the long-standing Argentine embargo on cattlehide exports that suppressed Argentine hide and leather prices and thereby subsidized exports of low-priced leather to the United States.

After an investigation and verification, the Department determined that the embargo was limited to a specific industry, the tanning industry, and was, therefore, countervailable to the extent that it was causing hide prices to be lower than they would have been absent the embargo. In September 1990, the Department directed the Customs Service to levy countervailing duties averaging 15 percent on almost all types of leather imported from Argentina until further notice. The industry expected these additional duties to narrow the price gap between U.S. and Argentine leathers in the U.S. market.

Outlook for 1991

Leather shipments are expected to increase in 1991, to about 15.2 million equivalent cattlehide units. Their constant-dollar value will increase about 9 percent. An increase in domestic slaughter will make more hides available for U.S. tanners, and a weaker U.S. dollar will stimulate export demand for this leather. Higher duties on imported leather from Argentina, the most important source, should result in increased U.S. production.

Long-Term Prospects

The longer-term outlook for the leather tanning and finishing industry appears even brighter than that for 1991. The hide supply will continue to increase reversing a long-term downtrend and prices should decline. Producers of wet-blue leather, particularly meatpackers, will continue to increase their share, by quantity, of total U.S. leather production. Environmental problems will remain a concern, but new technology, equipment, and wet-blue plants will help the industry remain the most cost-competitive and highly productive of any in the world. If ongoing U.S. Government trade actions and negotiations result in greater access to international raw material and leather markets, this industry will achieve solid long-term growth.—*James E. Byron, Office of Consumer Goods, (202) 377-4034, September 1990.*

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SHOES AND SLIPPERS

The nonrubber footwear industry (SIC 314) produces all types of footwear except rubber protective and rubber-soled, fabric-upper footwear, both of which are classified in SIC 3021. In 1990, the value of industry shipments declined about 6.3 percent to an estimated $4.07 billion from $4.34 billion in 1989. This decrease resulted from a decline in unit shipments of about 10 percent. The rate of decline varied among the 4 major sectors of the industry: house slippers (SIC 3142), and men's footwear, except athletic (SIC 3143), were each down about 15 percent; women's footwear, except athletic (SIC 3144), and footwear, except rubber, n.e.c. (SIC 3149), were down about 8 percent and 2 percent, respectively.

Production

For the second consecutive year, production of nonrubber footwear declined about 10 percent to an estimated 204.7 million pairs, from 227.4 million in 1989. Production losses were largest for soft-sole slipper and men's cement-sole types. Production of Goodyear welt types of men's footwear recovered somewhat from declines in 1988 and 1989. Injection-molded footwear production, particularly string-lasted types, increased strongly.

In 1990, slipper production declined about 16 percent from 1989, men's production dropped about 14.5 percent; women's, about 8 percent, and footwear n.e.c., about 2 percent. In the latter category, production of children's and athletic footwear increased over 1989 levels. The most recent 2-year decline in nonrubber footwear production renewed a downward trend that began in 1968 when output peaked at 642 million pairs. Production has declined at a compound annual rate of about 4.8 percent over this 22-year period, although it stabilized somewhat between 1986 and 1988.

House Slippers

Shipments of slippers declined about 16 percent in 1990 to an estimated 49.4 million pairs from 58.7 million pairs in 1989, and their product value declined from $226.1 million to $196.9 million. Slippers accounted for about 26 percent of the quantity, but only 6 percent of the value, of total shipments of nonrubber footwear in 1990. Only about 6 percent of slippers were produced with leather uppers.

Women's Footwear, Except Athletic

Domestic production of women's footwear declined about 8 percent in 1990 to an estimated 63.5 million pairs from 69 million pairs in 1989. Shipments of women's footwear also declined about 8 percent to an estimated 67.1 million pairs in 1990 from 72.8 million pairs in 1989. The value of product shipments declined to $1.35 billion from $1.4 billion a year earlier. Women's footwear accounted for 31 percent by quantity and 35 percent by value of all nonrubber footwear product shipments in 1990. Import penetration was 87 percent for the period in the women's sector.

Men's Footwear, Except Athletic

Production of men's footwear, which includes dress and casual shoes and work shoes and boots, declined about 15 percent in 1990, to 42 million pairs from 49.1 million pairs in 1989. Shipments of these products also declined about 15 percent, from 51.9 million pairs in 1989 to an estimated 44.4 million pairs in 1990. The value of product shipments of men's footwear dropped in 1990 to an estimated $1.75 billion from $1.92 billion in 1989. Men's footwear accounted for 21 percent by quantity and 45 percent by value of total U.S. nonrubber footwear shipments in 1990. Over

Trends and Forecasts: Footwear, Except Rubber (SIC 314)

(in millions of dollars except as noted)

Item	1987	1988[1]	1989[2]	1990[2]	1991[3]	Percent Change 1987–88	1988–89	1989–90	1990–91
Industry Data									
Value of shipments[4]	4,073	4,294	4,336	4,066	—	5.4	1.0	−6.2	—
3142 House slippers	233	244	257	224	—	4.7	5.3	−12.8	—
3143 Men's footwear	2,105	2,244	2,188	1,993	—	6.6	−2.5	−8.9	—
3144 Women's footwear	1,316	1,333	1,301	1,253	—	1.3	−2.4	−3.7	—
3149 Footwear nec	419	472	591	596	—	12.6	25.2	0.6	—
Value of shipments (1987$)	4,073	4,067	3,915	3,509	3,411	−0.1	−3.7	−10.4	−2.8
3142 House slippers	233	229	232	195	187	−1.7	1.3	−15.9	−4.1
3143 Men's footwear	2,105	2,098	1,931	1,669	1,603	−0.3	−8.0	−13.6	−4.0
3144 Women's footwear	1,316	1,291	1,224	1,137	1,103	−1.9	−5.2	−7.1	−3.0
3149 Footwear nec	419	449	529	508	518	7.2	17.8	−4.0	2.0
Total employment (000)	71.1	72.0	68.5	63.6	—	1.3	−4.9	−7.2	—
Production workers (000)	62.2	62.8	59.9	55.5	—	1.0	−4.6	−7.3	—
Average hourly earnings ($)	5.91	6.11	6.42	6.76	—	3.4	5.1	5.3	—
Capital expenditures	38.0	40.3	—	—	—	6.1	—	—	—
3142 House slippers	2.7	4.1	—	—	—	51.9	—	—	—
3143 Men's footwear	17.4	19.4	—	—	—	11.5	—	—	—
3144 Women's footwear	11.3	14.0	—	—	—	23.9	—	—	—
3149 Footwear nec	6.6	2.8	—	—	—	−57.6	—	—	—
Product Data									
Value of shipments[5]	3,862	4,065	4,105	3,858	—	5.3	1.0	−6.0	—
3142 House slippers	205	215	226	197	—	4.9	5.1	−12.8	—
3143 Men's footwear	1,834	1,972	1,923	1,752	—	7.5	−2.5	−8.9	—
3144 Women's footwear	1,374	1,432	1,398	1,346	—	4.2	−2.4	−3.7	—
3149 Footwear nec	449	447	559	563	—	−0.4	25.1	0.7	—
Value of shipments (1987$)	3,862	3,860	3,714	3,341	3,248	−0.1	−3.8	−10.0	−2.8
3142 House slippers	205	201	203	172	165	−2.0	1.0	−15.3	−4.1
3143 Men's footwear	1,834	1,845	1,700	1,467	1,408	0.6	−7.9	−13.7	−4.0
3144 Women's footwear	1,374	1,390	1,320	1,221	1,185	1.2	−5.0	−7.5	−2.9
3149 Footwear nec	449	424	492	481	490	−5.6	16.0	−2.2	1.9
Quantity shipped (Million Pairs)	226	239	240	217	212	5.8	0.4	−9.6	−2.3
3142 House slippers	47.1	58.4	58.7	49.4	47.4	24.0	0.5	−15.8	−4.0
3143 Men's footwear	57.1	56.7	51.9	44.4	42.6	−0.7	−8.5	−14.5	−4.1
3144 Women's footwear	78.2	75.9	72.8	67.1	65.1	−2.9	−4.1	−7.8	−3.0
3149 Footwear nec	43.8	48.2	57.0	55.7	56.8	10.0	18.3	−2.3	2.0

[1] Advance data from the 1988 Annual Survey of Manufactures.

[2] Estimate.

[3] Forecast.

[4] Value of all products and services sold by establishments in the footwear, except rubber industry.

[5] Value of products classified in the footwear, except rubber industry produced by all industries.

SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA). Estimates and forecasts by ITA.

90 percent of men's footwear was made with leather uppers. Import pentration of this section was 71 percent.

Footwear, Except Rubber, N.E.C.

Shipment of footwear for youths and boys, misses, children, infants and babies, and athletic and other miscellaneous types of footwear declined about 2 percent to 55.7 million pairs; however, their value increased to $563 million in 1990 from $559 million in 1989. Shipments of footwear in this group accounted for 26 percent by quantity and 15 percent by value of all product shipments of nonrubber footwear in 1990.

In 1990, production of all of these types declined about 2 percent to 52.6 million pairs from 53.8 million pairs in 1989. For January-June 1990, production was up 154 percent for athletic footwear, 10 percent for misses' footwear and 6 percent for children's footwear over the same period in 1989. Production was down 11 percent for youths' and boys' and 4 percent for infants' and babies' footwear.

Including rubber/fabric footwear (sneakers) imports and domestic production, athletic footwear consumption increased to an estimated 565 million pairs in 1990. This total represented 40 percent of combined nonrubber and rubber/fabric footwear consumption of about 1.4 billion pairs.

For January-June 1990, imports of all juvenile footwear were up 7 percent over the same period in 1989, and imports of athletic nonrubber footwear were up 11 percent. Import penetration was 83.8 percent for juvenile footwear and 93.1 percent for athletic nonrubber footwear.

Footwear Consumption

In 1990, apparent consumption of nonrubber footwear increased for the first time in 3 years, about 3 percent to an estimated 1.102 billion pairs. Per capita consumption also increased in 1990 to about 4.43 pairs from 4.35 pairs in 1989. From a low of 3.3 pairs in 1980, per capita consumption gradually increased to a high of 4.9 pairs in 1986 before turning down again. The rise in demand was met by increased imports. During the early 1980s, growing consumer demand for nonrubber athletic footwear was largely offset by a decline in rubber/canvas footwear consumption. After 1986, this trend was reversed: per capita consumption of nonrubber footwear dropped, and rubber/canvas footwear consumption increased. In 1990, rubber/canvas footwear consumption continued to increase for the fourth consecutive year—about 20 percent from 1989—and reached an estimated high of 310 million pairs or 1.25 pairs per capita.

Personal consumption expenditures (PCE) on both rubber and nonrubber footwear in 1990 increased about 0.83 percent of total (PCE), down slightly from 1989. However, PCE in constant (1982) dollars remained unchanged, indicating that unit retail sales were stagnant and inventories were increasing at all levels in the distribution chain.

In 1990, consumers demanded comfortable footwear with proper fit. Casual and walking shoes in particular reflected these qualities. Technology that had incorporated padded collars, linings, and insoles, and other comfort features into athletic footwear was being used to produce more functional shoes, including those with traditional styling. Boat shoes and moccasins, with water-resistant leather uppers in a wide variety of colors, were selling very well. Boots also were popular, and women's pumps in classic styles had higher heels.

Prices and Profits

The average factory price for nonrubber footwear in 1990 increased about 21 percent to an estimated $21.70 from $17.04 in 1989. This rise followed increases of 8 percent in 1988 and 12 percent in 1989 and reflected substantially higher prices for leather over the 3-year period. The producer price index for nonrubber footwear was up 4.6 percent for the first seven months of 1990, while the Consumer Price Index for all footwear, including imports, increased about 2.5 percent over the same period.

An analysis by *Footwear News* (August 1990) indicated that, as a group, 22 publicly held footwear resource companies reported a 19-percent increase in sales in 1989 over 1988 and a 54-percent increase in profits. However, 48 percent of total sales and 76 percent of total profits for the group were accounted for by the three largest athletic footwear producers, all of which manufacture overseas. Profits to sales for the group increased to 6 percent in 1989 from 4.6 percent in 1988. By contrast, the ratio for the three athletic producers ranged from 8.9 to 9.8 percent. The same survey also indicated that, in 1989, profits and profit margins also rose for a group of five publicly held footwear retailers. However, this strong performance came from their apparel and specialty segments rather than footwear.

In 1989, foreign athletic producers were performing far better than domestic manufacturers, according to another industry survey. For 5 athletic companies, return on sales averaged 9.4 percent in 1989, compared with 4.8 percent for 15 other manufacturing companies; return on total equity was 25 percent for the athletic companies compared with 11.7 percent for the other manufacturers; and return on invested capital was 22.5 percent for the athletics versus 9.2 percent for the manufacturers.

Employment

Total employment in 1990 declined about 7 percent to an estimated 63,600, from 68,500 in 1989. Production employment in 1990 also declined about 7 percent, to 55,500 from 59,900 in 1989. Bureau of Labor Statistics data on industry productivity indicated a decline of 3 percent for the first 6 months of 1990 compared with the same period in 1989. Productivity had trended upward at an annual rate of 2 percent from 1981 to 1989.

The Census of Manufactures for 1987 lists 379 companies operating 471 establishments in the nonrubber footwear industry, down from 558 companies and 751 establishments in 1982. Other sources indicate that the industry has experienced net factory closings every year except 2 dating back to the mid-1960s, when 990 plants were operating. By 1990, the number of plants had declined to less than 300.

Surveys by the United States International Trade Commission in 1985 indicated that two-thirds of the nonrubber footwear companies accounted for less than 14 percent of total domestic production. In 1990, the 20 largest producers captured about 55 percent of total domestic output.

Production Trends

In 1990, about 55 percent of domestically produced nonrubber footwear contained leather uppers, 4 percent less than for imported nonrubber footwear. Despite the large increase in hide and leather prices, consumers continued to prefer leather over all other upper materials. Leather footwear provides higher profit margins than other materials both for U.S. manufacturers and for importers.

Widespread use of computers is shortening production time and improving market response for manufacturers. In order to maintain competitiveness, manufacturers must respond to trends in fashion in hours and days rather than weeks. Computer-aided shoemaking—which includes computer-aided design, computer-aided manufacturing, and computer-integrated manufacturing (CAD, CAM, and CIM) systems—helps manufacturers improve competitiveness through better quality, greatly expanded design flexibility, and lower production costs.

CAD systems allow manufacturers to change dimensions, patterns, texture, and color of material instantaneously. CAD computerizes data that can later be used to cut patterns, dies, and materials; make lasts; cost the product; and operate CAM systems. The latest CAM technology provides for automatic stitching and cutting. Computers also allow manufacturers to combine several operations or machines under fewer operators, thereby reducing handling time and improving quality control. Computerized robots have been developed for handling and transfer operations within and between these modules. All of these various computer systems are being combined with CIM systems.

INTERNATIONAL COMPETITIVENESS

Imports Up Again

After 3 consecutive years of decline, nonrubber footwear imports increased in 1990 about 6 percent to an estimated 912 million pairs, from 860 million pairs in 1989. The customs value—excluding insurance, freight, and duty—of 1990 imports reached an estimated $8.5 billion, up 14 percent from $7.44 billion in 1989. Imports of slippers represented about 21 percent, by quantity, of apparent consumption for January-June 1990. For January-June 1990, imports of men's nonrubber footwear totaled 53 million pairs, unchanged from the same period in 1989.

Imports grew from 175 million pairs in 1968 to 941 million in 1986, a compound annual rate of growth of 9.8 percent. Imports stabilized at about 375 million pairs and 50 percent of apparent consumption during the 4-year period beginning in June 1977 of the quotas imposed by the Orderly Marketing Agreements (OMAs) with South Korea and Taiwan. However, after these agreements were allowed to expire in 1981, imports increased by more than 100 million pairs annually, reaching a peak of 941 million pairs in 1986. Import penetration peaked the following year at 82 percent of apparent consumption and declined to 79 percent in 1989 before rising again to an estimated 82 percent for 1990.

During the first 6 months of 1990, U.S. imports of nonrubber footwear totaled 453.5 million pairs, up about 6.5 percent from the same period in 1989 (Table 3). Imports from China rose about 85 percent, or 52 million pairs, as more production from Taiwan was shifted there because of lower labor costs. Other countries showing large percentage gains over 1989 were Indonesia (252 percent) and Thailand (57 percent).

From January-June 1990, the average unit price (customs value) for imported nonrubber footwear was $8.69, up about 9 percent from the same period in 1989. As the year progressed, import prices increased more rapidly as the U.S. dollar weakened and leather prices firmed. Worldwide leather supplies tightened further in 1990, and the higher prices reduced somewhat the competitive advantage of imports from traditional suppliers such as Taiwan, Korea, and Brazil over domestic producers.

For January-June 1990, the five largest suppliers of nonrubber footwear to the United States were China (25 percent of total quantity); Taiwan (21 percent); Korea (18 percent); Brazil (13 percent); and Italy (7 percent). As Table 3 shows, these five countries accounted for 84 percent of all U.S. nonrubber footwear imports for the 6-month period. Although the United States imported nonrubber footwear from over 90 countries during this period only six other countries—Thailand, Indonesia, Spain, Hong Kong, the Philippines, and Mexico—captured more than 1 percent of the U.S. market for imported footwear.

Table 3: U.S. Nonrubber Footwear Imports

January-June, 1990

Country	Quantity		Value[1]			Percent Change 1989-1990[2]		
	Thousands of Pairs	Percent of Total	Millions of Dollars	Percent of Total	Average Per Pair $	Quantity	Value	Unit Value
China	113,214	25.0	487.7	12.4	4.31	85.0	141.5	30.6
Taiwan	96,634	21.3	688.2	17.5	7.12	−31.9	−23.7	12.0
South Korea	80,329	17.7	1,050.2	26.6	13.07	2.2	20.5	17.9
Brazil	59,238	13.1	515.4	13.1	8.70	−3.2	5.5	9.0
Italy	29,602	6.5	486.6	12.3	16.44	19.5	26.4	5.8
Thailand	15,107	3.3	120.0	3.1	7.94	57.4	83.3	16.4
Indonesia	14,308	3.2	97.9	2.5	6.84	252.3	273.9	6.1
Spain	11,208	2.5	175.6	4.5	15.66	−2.6	7.1	9.8
Hong Kong	6,950	1.5	45.3	1.2	6.51	−14.0	−12.8	1.4
Philippines	5,478	1.2	16.2	0.4	2.97	41.0	16.9	−17.0
Mexico	5,250	1.2	37.9	1.0	7.22	23.0	7.3	−12.8
India	2,455	0.5	21.0	0.5	8.55	25.8	25.6	−0.1
Yugoslavia	2,207	0.5	29.6	0.7	13.41	3.4	22.2	18.3
Portugal	1,493	0.3	25.0	0.6	16.73	34.3	37.6	2.4
All Other	10,033	2.2	143.6	3.6	14.31	−15.2	−4.2	12.9
World Total	453,506	100.0	3,940.2	100.0	8.69	6.5	15.8	8.8
European Economic Community	43,986	9.7	735.9	18.7	16.73	11.8	20.3	7.5

[1] Customs value, imports for consumption.

[2] First-half 1989 to first-half 1990.

SOURCE: U.S. Department of Commerce: Bureau of the Census and International Trade Administration.

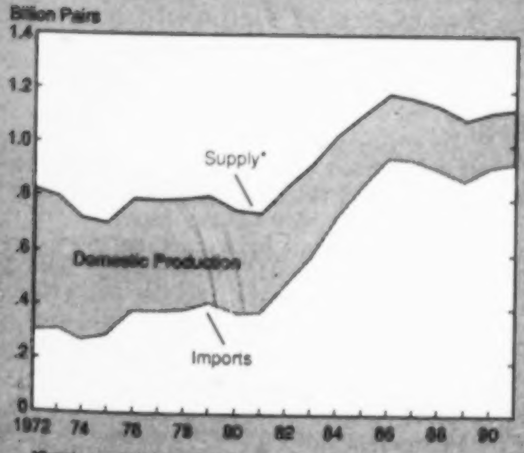
Korea, Brazil, China, Taiwan, and Italy were projected to be the largest suppliers of U.S. leather footwear imports for the entire year, accounting for about 85 percent, by quantity, of imports. China, Brazil, and Taiwan, in that order, were the largest suppliers of men's leather footwear; Brazil and Italy, women's leather footwear; Korea and Italy, juvenile leather footwear; and Korea, Taiwan, and China, leather athletic footwear.

U.S. leather footwear imports accounted for about 59 percent of total nonrubber footwear imports in 1990. This proportion was unchanged from 1989 and remained several percentage points higher than that for domestic production. For January-June 1990, the average unit value for leather footwear imports was $11.91, up about 12 percent over the same period in 1989 but still substantially below that for domestic production.

For January-June 1990, China accounted for 45 percent, by quantity, of all U.S. imports of nonrubber footwear with vinyl or plastic uppers; Taiwan supplied about 40 percent. U.S. imports of footwear with vinyl or plastic uppers accounted for about 37 percent, by quantity, of total nonrubber footwear imports for the period. The average unit price was about $4.10.

U.S. manufacturers export large quantities of cut footwear parts to many developing countries where they are assembled and exported to the United States as finished or partly finished products. Under the U.S. Tariff Schedule, duties are assessed only on the value-added content. Moreover, U.S. duties on partially finished but unlasted nonrubber footwear are 5 percent or below compared with 8.5 percent or more for completed leather footwear. Frequently, final manufacturing operations requiring less labor—such as bottoming, finishing, and packing—are performed in the United States. During January-June 1990, U.S. imports of such partially assembled leather footwear totaled about 11 million pairs, primarily from the Dominican Republic, Mexico, and Brazil.

Figure 35-2
U.S. Nonrubber Shoe Supply by Source



*Supply equals U.S. production plus imports.

Source: U.S. Department of Commerce, Bureau of the Census, and International Trade Administration.

Exports Also Up

In 1990, U.S. nonrubber footwear exports also increased by about 5 percent to an estimated 15.1 million pairs. Their value increased about 50 percent to an estimated $270 million. The average unit price of these exports was about $14.95, up 46 percent from 1989. The weaker U.S. dollar encouraged export growth as U.S. producers found it easier to compete in high-cost, developed-country markets. However, about 15 percent of total exports represented partially assembled footwear, particularly slippers, shipped to developing countries where they were finished and re-exported to the United States.

For the first 6 months of 1990, the United States exported 7.7 million pairs of nonrubber footwear valued at $124.7 million. Mexico received the largest quantity during that period—1.085 million pairs, or 14 percent of the total, valued at $3.8 million. Almost all of these were slippers.

Canada ranked second, with 960,000 pairs, or 12 percent of U.S. exports, valued at $21.1 million. This growth resulted from the phased reduction in Canadian duties on imported footwear under the U.S.-Canada Free Trade Agreement that became effective in 1989.

Japan ranked third with 866,000 pairs, or 11 percent, of U.S. exports. These exports were down about 21 percent from the same 6-month period in 1989. Although certain types of U.S.-produced leather footwear are price-competitive in the Japanese market, and over 80 percent of all 1990 U.S. footwear imports to Japan were athletic footwear (exempt from Japan's restrictive global tariff-rate quotas on leather footwear exports), these quotas and the licensing procedures required to administer them discourage U.S. manufacturers' attempts to export to Japan. The Japanese market for leather footwear is estimated to exceed 100 million pairs. Japan's global tariff-rate quotas, which are legal under General Agreement on Tariffs and Trade (GATT) regulations, restricted leather footwear imports to about 3.5 million pairs for Japan's fiscal year 1989. The United States was unable to capture only about 5 percent of the global quota.

For the period January-June 1990, Italy was the fourth largest market for U.S. exports, followed by the Netherlands, France, West Germany, and the United Kingdom. In 1990, U.S. manufacturers were more successful in increasing exports to the European Community countries than to any other area.

Legislation

In September 1990, the Congress passed and sent to the President the Textile, Apparel and Footwear Trade Act of 1990 that limited the aggregate annual quantity of nonrubber footwear imports to the 1989 level of 860 million pairs, with subquotas also set by price category. Previous attempts to enact similar legislation in 1985 and 1987 were vetoed; the outcome of the present initiative was also uncertain. Also, legislation extending the Caribbean Basin Initiative (CBI), which provided duty-free status for most products, except footwear, leather products, and several others, appeared certain to be passed by the Congress in 1990 with the footwear and leather products duty exemptions again included.

Outlook for 1991

Shipments of nonrubber footwear are expected to decline about 2 percent in 1991 to 211.9 million pairs. Shipments will decline in three sectors: slippers by 4 percent, to 47.4 million pairs; men's footwear, 4 percent, to 42.6 million pairs; and women's footwear, 3 percent, to 65.1 million pairs. Shipments of footwear, except rubber, n.e.c., will increase 2 percent to 56.8 million pairs, primarily because of expected production gains in the athletic, misses', and children's subsectors. Imports of nonrubber footwear, by quantity, are expected to increase for the second consecutive year, by about 3 percent. As a result, both apparent consumption and per capita consumption are expected to increase slightly. Import penetration will rise to about 83 percent.

Long-Term Prospects

The long-term outlook for the nonrubber footwear manufacturing industry is only slightly brighter. Industry production is expected to increase gradually over the next 5 years. Assembly of footwear from cut and sewn uppers produced offshore will increase substantially. Weaker firms will continue to close. Stronger ones will consolidate plants and invest in new technology designed to narrow the disparity between foreign and U.S. labor costs. The industry's capacity to respond quickly and effectively to changes in the market at the retail level is improving rapidly. Success in this area is essential to partially offset the lower costs of new Southeast Asian suppliers in Thailand, Indonesia, and China. Faced with this competition, the industry will have great difficulty achieving real growth.—*James E. Byron, Office of Consumer Goods, (202) 377-4034, September 1990.*

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(Call the Bureau of the Census at 301-763-4100 for information about how to order Census documents.)

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LUGGAGE AND PERSONAL LEATHER GOODS

The luggage and personal leather goods industries produce a wide variety of consumer goods, including leather gloves and mittens (SIC 3151); luggage (SIC 3161); women's handbags and purses (SIC 3171); personal leather goods (SIC 3172), and leather and sheeplined clothing (SIC 2386).

The total value of industry shipments for all 5 of these industries increased about 1 percent in 1990 to an estimated $2.46 billion. The value of product shipments also increased 1 percent to about $2.13 billion. But when measured in constant dollars, industry and product shipments each declined in 1990 about 3.3 percent from 1989. In 1990, industry employment fell 3.7 percent to 31,600, and production employment dropped 3.8 percent to 25,000.

INTERNATIONAL COMPETITIVENESS

Because labor costs represent such a high proportion of total production costs, these industries all encounter significant import competition, especially from developing countries where wage rates are far below U.S. levels. In 1990, the value of imports of luggage and personal leather goods rose about 15 percent to an estimated $3.96 billion. The import to apparent consumption ratio for the group rose to 66 percent in 1990 from 62 percent in 1989.

Primarily because of the weaker U.S. dollar, the value of exports for the group in 1990 also rose a substantial 21 percent to an estimated $195.7 million.

Leather Gloves and Mittens

The U.S. leather glove and mitten industry is composed of 2 product segments: work gloves and mittens, which account for over 85 percent of domestic production; and dress gloves and mittens, accounting for the remaining 15 percent. These products are made either entirely of leather or of a combination of leather and textiles, such as cotton, wool or nylon.

The value of product shipments in 1990 rose about 3.3 percent to $168 million. Measured in constant dollars, however, product shipments declined about 2 percent. Industry and production employment each declined about 2 percent to 2,800 and 2,500 employees, respectively.

Apparent consumption, by value, of leather gloves and mittens in 1990 was up about 3.5 percent over 1989 to an estimated $333 million. Imports reached an estimated $178.8 million, 54 percent of apparent consumption. Principal sources of imports, by quantity, were China, with 77 percent of total imports; Hong Kong (8 percent); and the Philippines (5 percent).

Exports of leather gloves and mittens in 1990 increased about 24 percent to an estimated $14.3 million. However, almost 75 percent of these, by quantity, were exports of cut parts to Mexico for assembly and reentry into the United States as finished gloves. Under section 9802 (formerly 807) of the Harmonized Tariff Schedule of the United States, these are subject to U.S. duties only on the value-added content.

Luggage

The luggage industry produces a variety of products, including suitcases, briefcases, hand luggage, tote bags, trunks, and occupational cases. Materials used include leather; plastics; fabrics, such as nylon, cotton, and linen; and metals. Combinations of these materials are frequently used. Construction methods include sewing, molding, and laminating. About 25 percent of U.S.-produced finished goods are made of leather and leather usage is highest in attaches and briefcases.

In 1990, the value of luggage product shipments increased about 3.5 percent to $967 million. In constant dollars, however, product shipments declined about 2 percent. Both total employment and production employment declined about 2 percent to 11,200 and 8,400, respectively.

Apparent consumption, by value, of luggage in 1990 was up about 13 percent over 1989 to an estimated $2.1 billion.

Trends and Forecasts: Luggage and Personal Leather Goods (SIC 2386,315,316,317)

(in millions of dollars except as noted)

Item	1987	1988[1]	1989[2]	1990[2]	1991[3]	Percent Change 1987-88	1988-89	1989-90	1990-91
Industry Data									
Value of shipments[4]	2,258	2,347	2,425	2,458	—	3.9	3.3	1.4	—
2386 Leather/-lined clothing	202	220	222	223	—	8.9	0.9	0.5	—
3151 Leather gloves/mittens	185	191	205	212	—	3.2	7.3	3.4	—
3161 Luggage	929	957	1,026	1,061	—	3.0	7.2	3.4	—
3171 Women's handbags/purses	549	563	537	504	—	2.6	−4.6	−6.1	—
3172 Personal goods nec	393	415	436	458	—	5.6	5.1	5.0	—
Value of shipments (1987$)	2,258	2,218	2,203	2,131	2,100	−1.8	−0.7	−3.3	−1.5
2386 Leather/-lined clothing	202	205	199	193	186	1.5	−2.9	−3.0	−3.6
3151 Leather gloves/mittens	185	180	175	172	170	−2.7	−2.8	−1.7	−1.2
3161 Luggage	929	907	929	911	902	−2.4	2.4	−1.9	−1.0
3171 Women's handbags/purses	549	533	502	453	440	−2.9	−5.8	−9.8	−2.9
3172 Personal goods nec	393	393	398	401	403	0.0	1.3	0.8	0.5
Total employment (000)	33.3	33.2	32.8	31.6	—	−0.3	−1.2	−3.7	—
Production workers (000)	26.3	26.4	26.0	25.0	—	0.4	−1.5	−3.8	—
Average hourly earnings ($)	6.36	6.59	7.10	7.47	—	3.6	7.7	5.2	—
Capital expenditures	27.1	21.3	—	—	—	−21.4	—	—	—
2386 Leather/-lined clothing	0.9	0.5	—	—	—	−44.4	—	—	—
3151 Leather gloves/mittens	0.7	0.6	—	—	—	−14.3	—	—	—
3161 Luggage	11.8	9.2	—	—	—	−22.0	—	—	—
3171 Women's handbags/purses	10.2	8.1	—	—	—	−20.6	—	—	—
3172 Personal goods nec	3.5	2.9	—	—	—	−17.1	—	—	—
Product Data									
Value of shipments[5]	2,020	2,176	2,246	2,277	—	7.7	3.2	1.4	—
2386 Leather/-lined clothing	175	192	193	194	—	9.7	0.5	0.5	—
3151 Leather gloves/mittens	147	152	162	168	—	3.4	6.6	3.7	—
3161 Luggage	817	871	934	967	—	6.6	7.2	3.5	—
3171 Women's handbags/purses	469	537	512	480	—	14.5	−4.7	−6.3	—
3172 Personal goods nec	412	424	446	468	—	2.9	5.2	4.9	—
Value of shipments (1987$)	2,020	2,057	2,041	1,974	1,947	1.8	−0.8	−3.3	−1.4
2386 Leather/-lined clothing	175	180	174	169	162	2.9	−3.3	−2.9	−4.1
3151 Leather gloves/mittens	147	140	136	133	132	−4.8	−2.9	−2.2	−0.8
3161 Luggage	817	825	844	828	819	1.0	2.3	−1.9	−1.1
3171 Women's handbags/purses	469	512	482	436	423	9.2	−5.9	−9.5	−3.0
3172 Personal goods nec	412	400	405	408	410	−2.9	1.2	0.7	0.5

[1] Advance data from the 1988 Annual Survey of Manufactures.

[2] Estimate.

[3] Forecast.

[4] Value of all products and services sold by establishments in the luggage and personal leather goods industry.

[5] Value of products classified in the luggage and personal leather goods industry produced by all industries.

SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA). Estimates and forecasts by ITA.

Imports rose 22 percent to $1.22 billion and represented 58 percent, by value, of apparent consumption. Countries with the largest shares of U.S. imports of luggage were Taiwan (37 percent); China (21 percent); Korea (19 percent); Thailand (4 percent); and Mexico (4 percent).

Exports of luggage in 1990 increased about 25 percent to an estimated $82.5 million. Mexico, Japan, Canada, Ireland, the United Kingdom, and West Germany were the largest importers of U.S. luggage.

Handbags

The handbag industry produces women's handbags and purses of leather and other materials, except jewelry and precious metal which are classified in SIC 3911. Leather's share, by quantity, of domestic handbag shipments in 1987 was 61 percent.

In 1990, the value of handbag product shipments declined about 6 percent to $480 million. Product shipments, in constant dollars, also declined about 10 percent. Industry and production employment declined about 10 percent each to 7,800 and 6,500 employees, respectively.

Apparent consumption, by value, of handbags in 1990 dropped about 1 percent to $1.31 billion. Imports of handbags increased 2 percent to an estimated $854 million and accounted for 65 percent, by value, of apparent consumption. Import penetration, by quantity, was about 87 percent. Countries with the largest shares by quantity of U.S. handbag imports were China (59 percent); Korea (15 percent); Taiwan (11 percent); India (4 percent); and Hong Kong (3 percent).

Exports of handbags in 1990 declined about 4 percent to $24.5 million. However, exports to Mexico were mostly cut handbag parts that were assembled there and re-exported to the United States as finished goods. Mexico, Canada, and Japan were the leading importers, by quantity, of U.S. handbags.

Personal Leather Goods (Flatgoods)

This industry subsector produces such items as wallets and billfolds, and eyeglass, cigarette, key, and nonmusical instrument cases. These products are often referred to as flatgoods because they are small enough to fit into pockets or handbags. Flatgoods are made, in whole or in part, of either leather (which accounts for more than 60 percent of the value of principal materials consumed in this sector), plastics, or textiles.

In 1990, product shipments increased about 5 percent to $468 million. Product shipments, in constant dollars, increased about 1 percent. Total employment and production employment increased about 1 percent each to 7,700 and 6,000 employees, respectively.

In 1990, apparent consumption of these products increased about 1 percent to $700 million. Imports declined about 2 percent to an estimated $253 million and import penetration, by value, was 36 percent, the lowest for the group. Principal foreign suppliers were China, Korea, and Taiwan. Italy ranked fourth, supplying mostly higher-priced flatgoods of leather.

U.S. exports of personal leather goods in 1990 rose 57 percent to about $20 million. Canada, Japan, Mexico, and West Germany were the leading export markets for personal leather goods.

Leather and Sheeplined Clothing

Leather wearing apparel manufacturers produce leather coats and jackets for men, women, and children, as well as pants, vests and skirts. Demand for leather and sheeplined clothing is more directly related to trends in fashion than is the case for other luggage and personal leather goods products, so consumption patterns vary widely from year-to-year. As leather prices rise—absolutely or relatively to other materials—consumers elect to purchase apparel of other materials or postpone such discretionary spending altogether. Although leather prices have increased in recent years and domestic producers have been adversely affected, importers have been able to partially offset these cost increases by buying from producers in Asian countries with far lower labor costs than those in the United States.

In 1990, product shipments of leather wearing apparel increased about 1 percent to $194 million. Product shipments in constant dollars, however, declined about 3 percent. Both total employment and production employment declined about 3 percent.

Apparent consumption, by value, of leather wearing apparel in 1990 increased about 21 percent to $1.6 billion, due primarily to import increases. In 1990, imports increased 25 percent from 1989 to an estimated $1.46 billion. Import penetration, by value, for leather wearing apparel was 91 percent, the highest of all the industries in this group. Korea remained the largest supplying country of leather wearing apparel accounting for a substantial 76 percent of total U.S. imports. Other significant suppliers included China, Taiwan, India, and Hong Kong.

U.S. exports of leather wearing apparel in 1990 rose 17 percent to $54 million. Japan, France, and Italy took the largest share of these exports.

Outlook for 1991

Demand for luggage and leather products is expected to slacken in 1991 as the economy slows. Imports will continue to capture a larger market share in most of these industries. As a result, constant dollar product shipments for this group of industries are expected to decline by 1.4 percent for the year. Rates of growth or decline for 1991 are expected to vary among the industries: gloves and mittens (SIC 3151), −1.0 percent; luggage (SIC 3161), −1.0 percent; handbags and purses (SIC 3171), −3.0 percent; personal leather goods (SIC 3172), 0.5 percent; and leather apparel (SIC 2386), −4.0 percent.

Long-Term Prospects

Consumer demand for luggage and leather products will strengthen again after 1991 because of demographic factors. Increased white-collar employment should result in increased purchases of leather office products. Growing numbers of professional women in the workforce will lead to higher sales of business cases. Larger numbers of retirees coupled with increases in disposable income may stimulate more travel and corresponding increases in luggage sales.

However, U.S. leather products manufacturers will continue to meet stiff competition from abroad. It is unlikely that any of the U.S. market lost to imports during the last 20 years will be recaptured in the next 20 years. But a lower-valued dollar should help American producers maintain their present share of an expanding U.S. market for luggage and leather products.—*James E. Byron, Office of Consumer Goods, (202) 377-4034, September 1990.*

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Showcase, Luggage and Leather Goods Manufacturers of America Inc., 350 Fifth Avenue, New York, NY 10118. Telephone: (212) 695-2340.

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Cleaning Preparations and Cosmetics

Despite increasing costs caused by environmental and regulatory pressures, average growth in the cleaning preparations and personal care industries is expected to increase 3.5 percent in 1991. Consolidation will continue to concentrate production among fewer major companies.

This chapter covers the production and sale of soaps and detergents (SIC 2841); cleaners, polishes and sanitation goods (SIC 2842); surface active agents (SIC 2843); and cosmetics, toiletries and fragrances (SIC 2844). The value of shipments by these industries is estimated to have reached $41.7 billion in 1990. Product shipments were less, $38.7 billion. Real growth in product shipments was expected to have been 3.6 percent above 1989. Exports amounted to more than $1.4 billion in 1989, while imports came to $1 billion.

Before reading this chapter, please see "How to Get the Most Out of This Book" on page 1. It will clarify questions you may have concerning data collection procedures, factors affecting trade data, forecasting methodology, the use of constant dollars, the difference between industry and product data, sources and references, and the Standard Industrial Classification system (SIC).

In 1990, total employment declined an estimated 1.5 percent to 129,600, including about 78,600 production workers earning an average of $10.95 per hour. Productivity (measured as output per production worker) increased 5.4 percent in 1990 and is forecast to climb another 1.7 percent in 1991. After-tax profits were fairly constant at 6 percent.

Consolidation in the soap, cleaners, and toilet goods industries is leading to more concentration among larger firms. Three companies control an estimated two-thirds of the market for cleaning products.

The industries covered in this chapter face increasing costs as a result of environmental and regulatory pressures. Manufacturers are putting more resources into developing environmentally acceptable products, including cleaners that are more powerful and combine two or more functions. For example, laundry detergents that incorporate a water softener and a bleach require fewer containers and hence produce less overall waste.

As the number of women in the workforce increases, the number of men doing household chores will also increase. According to a survey, 1 out of every 5 American men do some or all of the household laundry. Many more men are also doing other chores, such as cleaning bathrooms and kitchen floors. And with more mothers working outside the home, the trend is to fewer but larger laundry loads. All this is adding to the demand for multi-function, cost-efficient products that are easy to use and store.

SOAPS AND DETERGENTS

Industry and product shipments are expected to increase 5.9 percent, to $12.8 billion and $10.7 billion, respectively, which represent 2.8 percent real growth for each. In 1989, the value of exports was $255 million, while imports were $145 million.

Employment was estimated at 32,100 in 1990, including 20,500 production workers earning an average of $13.90 per hour. Productivity is expected to have increased 1.8 percent.

The domestic market for the heavy-duty laundry detergent market is estimated at $3.7 billion in 1990, about 63 percent of which represented household detergents. The market is intensely competitive and marked by constant upgrading of formulas as manufacturers strive to increase market share. Detergent formulas are becoming more complex as well, incorporating fabric softeners, bleaching systems, and enzymes.

Sales of heavy-duty liquid laundry detergents have almost doubled over the last five years and now account for more than 40 percent of the heavy-duty market in the United States. Lately, however, sales of liquids have slowed, rising less than 3 percent a year, the same as powders. In areas where phosphates are banned or restricted, liquids which do not contain phosphates have captured more than half of the market. But in areas where phosphates are not restricted, liquids make up only 30 percent of the market.

Bar soaps shipments rose from $961 million in 1982 to $1.2 billion in 1987. That represents a compound annual growth of 4.4 percent a year, or 1 percent when price is factored out. But since 1987 sales of bar soap have increased 4.9 percent a year, with real growth of more than 1 percent. Volume reached an estimated 980 million pounds in 1990, and shipments were valued at $1.5 billion. Liquid toilet soaps make up about 10 percent of the toilet soap market with a volume estimated at 32.5 million gallons, valued at $143 million in 1991.

Sodium tripolyphosphate (STPP) is generally considered to be the safest, most effective, and lowest-cost water softener for use in detergents. However, it has been banned or restricted in some states because of its purported contribution to the eutrophication of streams and lakes. Industry experts say phosphates in detergents account for only about 20 percent of the problem, with most eutrophication being caused by human waste and commercial fertilizers. A possible solution is to remove phosphates from waste water for reuse in fertilizers. The process is

Trends and Forecasts: Soap, Cleaners, and Toilet Goods (SIC 284)

(in millions of dollars except as noted)

Item	1987	1988[1]	1989[2]	1990[2]	1991[3]	Percent Change 1987-88	1988-89	1989-90	1990-91
Industry Data									
Value of shipments[4]	34,747	37,624	39,820	41,696	—	8.3	5.8	4.7	—
2841 Soap & other detergents	11,559	11,945	12,137	12,847	—	3.3	1.6	5.8	—
2842 Polishes/sanitation gds	5,594	5,855	6,214	6,458	—	4.7	6.1	3.9	—
2843 Surface active agents	3,002	3,337	3,647	3,858	—	11.2	9.3	5.8	—
2844 Toilet preparations	14,593	16,486	17,822	18,535	—	13.0	8.1	4.0	—
Value of shipments (1987$)	34,747	36,222	37,486	38,804	40,156	4.2	3.5	3.5	3.5
2841 Soap & other detergents	11,559	11,394	11,715	12,040	12,365	−1.4	2.8	2.8	2.7
2842 Polishes/sanitation gds	5,594	5,637	5,780	5,925	6,075	0.8	2.5	2.5	2.5
2843 Surface active agents	3,002	3,101	3,256	3,435	3,615	3.3	5.0	5.5	5.2
2844 Toilet preparations	14,593	16,090	16,734	17,404	18,100	10.3	4.0	4.0	4.0
Total employment (000)	120	128	131	130	132	6.7	2.3	−0.8	1.5
2841 Soap & other detergents	31.7	32.9	31.8	32.1	32.5	3.8	−3.3	0.9	1.2
2842 Polishes/sanitation gds	20.6	20.5	21.8	22.5	23.0	−0.5	6.3	3.2	2.2
2843 Surface active agents	9.1	8.9	9.2	9.2	9.3	−2.2	3.4	0.0	1.1
2844 Toilet preparations	58.5	65.9	68.7	65.8	67.1	12.6	4.2	−4.2	2.0
Production workers (000)	72.6	79.8	80.0	78.6	80.1	9.9	0.3	−1.8	1.9
2841 Soap & other detergents	19.3	20.8	20.3	20.5	20.8	7.8	−2.4	1.0	1.5
2842 Polishes/sanitation gds	13.2	13.4	13.6	13.8	14.0	1.5	1.5	1.5	1.4
2843 Surface active agents	4.7	4.7	4.8	4.9	4.9	0.0	2.1	2.1	0.0
2844 Toilet preparations	35.4	40.9	41.3	39.4	40.4	15.5	1.0	−4.6	2.5
Average hourly earnings ($)	10.86	10.80	10.74	10.95	—	−0.6	−0.6	2.0	—
2841 Soap & other detergents	13.81	13.80	13.84	13.90	—	−0.1	0.3	0.4	—
2842 Polishes/sanitation gds	9.89	10.11	10.07	10.17	—	2.2	−0.4	1.0	—
2843 Surface active agents	13.37	13.68	13.63	13.94	—	2.3	−0.4	2.3	—
2844 Toilet preparations	9.22	9.10	9.22	9.14	—	−1.3	1.3	−0.9	—
Capital expenditures	785	866	—	—	—	10.3	—	—	—
2841 Soap & other detergents	339	308	—	—	—	−9.1	—	—	—
2842 Polishes/sanitation gds	118	71.6	—	—	—	−39.3	—	—	—
2843 Surface active agents	103	191	—	—	—	85.4	—	—	—
2844 Toilet preparations	226	297	—	—	—	31.4	—	—	—
Product Data									
Value of shipments[5]	32,404	34,891	36,994	38,730	—	7.7	6.0	4.7	—
2841 Soap & other detergents	9,528	9,990	10,138	10,735	—	4.8	1.5	5.9	—
2842 Polishes/sanitation gds	5,117	5,240	5,541	5,765	—	2.4	5.7	4.0	—
2843 Surface active agents	2,891	3,173	3,467	3,650	—	9.8	9.3	5.3	—
2844 Toilet preparations	14,868	16,490	17,848	18,580	—	10.9	8.2	4.1	—
Value of shipments (1987$)	32,404	33,533	34,739	35,988	37,289	3.5	3.6	3.6	3.6
2841 Soap & other detergents	9,528	9,537	9,795	10,070	10,352	0.1	2.7	2.8	2.8
2842 Polishes/sanitation gds	5,117	5,022	5,150	5,284	5,422	−1.9	2.5	2.6	2.6
2843 Surface active agents	2,891	2,876	3,020	3,171	3,337	−0.5	5.0	5.0	5.2
2844 Toilet preparations	14,868	16,098	16,774	17,462	18,178	8.3	4.2	4.1	4.1

[1] Advance data from the 1988 Annual Survey of Manufactures.

[2] Estimate.

[3] Forecast.

[4] Value of all products and services sold by establishments in the soap, cleaners, and toilet goods industry.

[5] Value of products classified in the soap, cleaners, and toilet goods industry produced by all industries.

SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA). Estimates and forecasts by ITA.

relatively inexpensive and makes phosphates a renewable resource. Detergent manufacturers oppose banning STPP on the ground that detergents with phosphates are superior to others. It is estimated that use of STPP, which is banned or restricted in at least 25 percent of the country, is declining 3 percent a year.

Phosphate-free detergents hold one-third of the detergents market. Home laundry detergents account for 17 percent of the volume of phosphate used.

Demand for zeolite, a substitute for phosphate, has escalated over the past three years. But according to industry experts, zeolites are less effective as water softeners than phosphate, and they cost more.

In addition to zeolite, the industry is working with other substitutes for phosphates. Use of powders with sodium silicate and calcium carbonate is growing. So is the use of enzymes. Already, the detergent industry is the biggest user of enzymes, accounting for $100 million of a $600 million market. Currently, Denmark controls half of the world's enzyme market.

By 1995, almost all of the enzymes in the world will be produced through the aid of biotechnology, which may also produce an enzymatic answer to bleaching. Indeed, the rapid pace of change that has characterized the industry in recent years is likely to continue as growing competition and environmental regulations force it to devote more resources to research and development. Already, according to industry experts, manufacturers spend a minimum of $100,000 on chemical analyses each time a competitor launches a new product or reformulates an old one.

INTERNATIONAL COMPETITIVENESS

In Europe, sales of the soaps and detergents industry have grown by an average of 5 percent. The European market is estimated to be about the same size as the U.S. market. Major European manufacturers are expanding internationally through acquisitions.

Phosphates are banned in about one third of Europe. None are allowed in Switzerland, while Italy, West Germany, Nor-

U.S. Exports and Imports
Soap, Cleaners, and Toilet Goods
(in millions of dollars except as noted)

SIC	Industry	1989	1990[1]	1991[2]	Percent Change 1989-90	Percent Change 1990-91
2841	Soap and other detergents					
	Value of exports	271	295	350	8.9	18.6
	Value of imports	148	165	188	11.5	13.9
2842	Polishes and sanitation goods					
	Value of exports	245	280	320	14.3	14.3
	Value of imports	143	153	165	7.0	7.8
2843	Surface active agents					
	Value of exports	251	294	345	17.1	17.3
	Value of imports	120	140	162	16.7	15.7
2844	Toilet preparations					
	Value of exports	694	800	930	15.3	16.2
	Value of imports	594	685	795	15.3	16.1
	Soap, Cleaners, and Toilet Goods					
	Value of exports	1,460	1,669	1,945	14.3	16.5
	Value of imports	1,006	1,143	1,310	13.6	14.6

[1] Estimate.

[2] Forecast.

SOURCE: U.S. Department of Commerce: Bureau of the Census, International Trade Administration (ITA). Estimates and forecasts by ITA.

way, and The Netherlands have imposed an almost complete ban.

Like the United States, Europe is moving toward environmentally friendlier products, especially detergents that contain no phosphates. Surfactants, which loosen and suspend dirt so that it can be washed away by water, make up as much as 40 percent of some liquid detergents. By way of contrast, surfactants normally make up 10 percent of powder phosphate-based products. Liquid laundry detergents have almost 20 percent of the market in Europe, a share that is expected to increase to 25 percent in the near future. But concern about surfactants in the environment is growing. There is also concern about the volume of plastic detergent containers being discarded.

Unlike in the United States, many Europeans do their shopping by bicycle or on foot. As a result, concentrated laundry products that are lighter to transport and which last longer are growing in popularity

U.S. Trade Patterns in 1989
Soap, Cleaners, and Toilet Goods
SIC 284
(in millions of dollars, percent)

Exports	Value	Share	Imports	Value	Share
Canada & Mexico	349	23.9	Canada & Mexico	198	19.7
South America	96.4	6.6	South America	25.9	2.6
European Community	244	16.7	European Community	258	25.6
East Asia NICs	212	14.5	East Asia NICs	51.7	5.1
Japan	135	9.2	Japan	85.9	8.5
Other	424	29.0	Other	387	38.4
World Total	1,460	100.0	World Total	1,006	100.0

Top Five Countries

Exports	Value	Share	Imports	Value	Share
Canada	266	18.2	France	307	30.5
Japan	135	9.2	Canada	150	14.9
United Kingdom	104	7.1	West Germany	140	13.9
Mexico	83.0	5.7	Japan	85.9	8.5
Australia	64.2	4.4	United Kingdom	68.9	6.9

See "How to Get the Most Out of This Book" for definitions of the Country Groupings.
SOURCE: U.S. Department of Commerce: Bureau of the Census, International Trade Administration (ITA).

Outlook for 1991

The value of industry shipments is forecast to increase 2.7 percent, after adjusting for any price increases. The value of product shipments will be slightly higher, about 2.8 percent. Employment will probably increase to 32,500, of which 20,800 will be production workers. Productivity is forecast to increase 1.3 percent.

Long-Term Prospects

The value of product shipments is forecast to continue growing by 2 to 3 percent a year through 1995. Heavy-duty liquids will hold about 40 percent of the market. Profit margins on liquids will be lower than on powders. Liquids cost more to make because they require more surfactant and, in the case of phosphate-free detergents, more costly substitutes. It is highly unlikely that phosphate-free detergents will gain a major share of the market in the United States unless a builder that is as cost effective as phosphates can be substituted.

According to a market survey, the demand for detergent chemicals will increase 2 percent a year, to 5.5 billion pounds by 1995. The greatest opportunities will be in specialty chemicals that can replace phosphates and add water-softening and other properties to existing detergent formulas.

POLISHES AND SANITATION GOODS

The value of the polishes and sanitation goods industry's shipments is expected to have increased to $6.5 billion in 1990, 3.9 percent over 1989, and 2.5 percent in real terms. Product shipments are believed to have reached $5.8 billion, 4 percent above 1989, and 2.6 percent in 1987 dollars. The value of exports in 1989 was $245 million and imports were $143 million.

Employment reached 22,500, of whom 13,800 were in production earning an average of $10.17 per hour. Productivity increased 1.1 percent.

Convenience is a major focus of this industry, as consumers increasingly demand multi-purpose products that achieve superior cleaning results with less time and effort. The institutional and industrial (I&I) cleaner market, which consumes a major share of the polishes and sanitation goods, consists of the janitorial, industrial, food service, and laundry sectors. The janitorial sector has the biggest share of the market with about 40 percent, followed by industrial with 30 percent, then food service 20 percent, and laundry 10 percent. The total market is estimated at $4.8 billion. The I&I business is service-oriented and very competitive. Smaller, regionalized companies dominate this market. However, the customer base is changing from these small independent companies to larger buying groups such as hospitals, restaurants, and motels and hotels. Consolidation is hurting the small independents. A decline in office building construction and vacancies in existing buildings will cause some slowdown in the I&I market. However, the decline should be offset somewhat by growth in motels and restaurants.

Only seven companies in the I&I market have sales exceeding $100 million. It is a highly segmented and fragmented business made up mostly of small regional

Colgate Palmolive Co.

Manufacturers are stepping up development of more powerful cleaners that combine two or more functions.

manufacturers. Although the industry is under growing cost and environmental pressures, the sector enjoys more brand loyalty than the retail sector.

The market for disinfectants has increased moderately, with shipments valued at $396 million in 1990, an increase of 1.7 percent a year since 1982.

Outlook for 1991

The value of industry shipments will increase about 2.5 percent, slightly less than the 2.6 percent estimated for product shipments. Employment will increase about 2.2 percent, with the number of production workers increasing by 1.5 percent to 14,000. Productivity is expected to increase about 1.2 percent.

For environmental reasons, formulators will be looking at substitutes for fluorocarbons and chlorinated hydrocarbons used as degreasers. In response to environmental and regulatory concerns, suppliers will provide consistently higher quality products.

Long-Term Prospects

This industry is forecast to grow at 2 to 3 percent a year through 1995. The long-term prospects are characteristic of a mature industry that is growing with the population. However, the I&I market may experience slower growth until the glut of empty office space ends.

In the United States and, increasingly, overseas, consumers will demand more effective cleaning agents. Manufacturers will cater to this demand with more all-purpose cleaners to take care of everything from ovens to floors.

SURFACE ACTIVE AGENTS

The value of surfactants industry shipments is estimated to have been $3.9 billion in 1990, 5.8 percent above 1989, or 5.5 percent in real value. The value of product shipments rose to $3.6 billion, an increase of 5 percent in real terms. The value of exports was $251 million in 1989, while imports were valued at $120 million.

Employment was estimated at 9,200 in 1990, with 4,900 production workers earning an average of $13.94 per hour. Productivity is estimated to have increased 2.9 percent.

The raw materials for surfactants come from either petrochemical feedstocks or naturally derived, renewable materials, such as vegetable oils and animal fats. About 90 percent of the major type of surfactant, anionic, comes from petrochemical sources, and 70 percent of the second largest type, nonionic, comes from petrochemicals. As prices of petrochemicals rise, natural materials become more competitive. In many applications, such as laundry detergents, natural and synthetic surfactants are interchangeable.

Sixty percent of the world's production of surfactants is consumed in developed countries, with more than 50 percent used in detergents.

The Far East is the fastest growing region for the surfactant industry. Japan's production reached an estimated 2.6 billion pounds in 1990, up 7 percent over 1989.

The U.S. surfactant industry has been restructuring in recent years, largely through a series of consolidations and acquisitions by Western European producers. The industry has evolved into a small group of multinational corporations.

Outlook for 1991

Adjusted for inflation, the value of industry shipments is expected to increase 5.3 percent. The value of product shipments may go up 5.2 percent in real terms. Total employment is expected to reach 9,300, of whom 4,900 will be production workers. Productivity will increase 5.3 percent.

Long-Term Prospects

The use of surfactants will gradually increase as environmental regulations force a further reduction in phosphate use. But this trend is being tempered by new water softener systems that come closer to the effectiveness of phosphates without the need to increase the surfactant content of detergents. Safer, milder, natural surfactants will be in increased demand.

Growth in the surfactants industry is forecast to be about 5 percent a year through 1995. The biggest gain will be in amphoteric surfactants, especially in personal care products, because of their milder properties. Surfactants with less odor will also be in demand for personal care products. Formulas will remain fairly stable, although formulators will favor surfactants that are more biodegradable than synthetic surfactants. Genetically engineered microorganisms may prove useful in producing new biodegradable surfactants.

COSMETICS

The cosmetics industry (SIC 2844) consists of five primary categories of personal care products: shaving preparations (SIC 28441); fragrances (SIC 28442); hair preparations (SIC 28443); dentrifices (SIC 28444); and cosmetics (SIC 28445). The value of cosmetics industry shipments was estimated to have been $18.5 billion in 1990, 4 percent over 1989 in constant dollars. The value of cosmetics products shipments was slightly higher. The value of exports in 1989 was $694 million, while imports were $594 million.

Total employment in this industry rose to 65,800, including 39,400 production workers earning an average hourly wage of $9.14. Productivity climbed 9 percent in 1990.

Personal care companies, especially the medium-sized ones, are undergoing consolidation. The business is highly competitive and growing more so as population growth rates stabilize. About 2,000 manufacturers make up the personal-care products industry.

In 1989, about 5,700 products were introduced into the U.S. market, but of these fewer than 800 were truly new products. New product development is focusing on milder formulations using natural ingredients and environmentally safer products. There is a marked shift away from ingredients made from animal by-products and synthetic organic chemicals.

Color cosmetics shipments are increasing by 4.5 percent a year, reaching $1.65 billion in 1990. Younger women are using less color, but older women continue to favor color cosmetics, especially foundations. Cosmetic companies introduced about 400 new shades of color in 1990.

The market for men's hair and skin products as well as fragrance products is increasing. The men's skin-care market seems poised for growth. Women still predominantly do the buying for men. The value of men's products is estimated at $850 million a year.

The cost of introducing a new major fragrance is estimated to have escalated to $50 million from $1 million 15 years ago. Most new products last fewer than 5 years in the marketplace. Shipments of fragrances are estimated to have reached $2.24 billion in 1990, having grown 4 percent a year since 1987.

Shipments of hair care products reached an estimated $4.6 billion in 1990, 8 percent above 1989. Exports were valued at $210 million while imports were $40 million. Shampoos account for about one-third of the hair care market, while tonics, conditioners, and rinses make up another 15 percent. The trend in hair products is towards milder, more natural ingredients

More than 85 percent of adults in the United States use underarm deodorants. The value of shipments of these products is estimated at $1.2 billion in 1990 and growing by 6.2 percent a year. The trend is toward stick solids, which now account for more than 60 percent of the market, up from 10 percent in 1980. Improvements in the active ingredients, such as polymers, have made stick deodorants much more effective. Microencapsulation of fragrance droplets used in deodorants permits sustained release of fragrance over the length of time the deodorant is active, up to 24 hours. Hypoallergenic antiperspirant/deodorant products are proving most effective for adults with sensitive underarm skin.

The value of skin care products (excluding sun care) shipments is growing 11.8 percent a year and is estimated to have reached $2.8 billion in 1990.

Shipments of sun care products are growing by more than 16 percent a year and are estimated to have reached $320 million in 1990. High technology is in evidence in the sun care market, with growing emphasis on sun screens that protect even when subjected to perspiration or water. Increasingly, consumers expect sun care products to help their skin as well, so such things as moisturizers are being added.

Outlook for 1991

Both industry and product shipments are expected to increase 4 percent, after adjusting for price increases. Employment will rise about 2 percent to 67,100 persons, of whom 40,400 will be production workers. Productivity will increase 1.5 percent.

Sales volume and prices are expected to remain stable. Producers of the more prestigious cosmetics are investing more in promotion, with the aim of weaning customers away from mass-market retailers and discount houses and attracting them to the department stores.

Long-Term Prospects

The value of shipments will grow at an estimated 4 percent a year through 1995, after adjusting for inflation. Competition will intensify as the number of cosmetic companies shrinks. More new products will be developed as the race for market share heats up.

The expansion of two-wage earner households will tend to increase personal spending for health and beauty aids. The growing importance of skin care products for the prevention of aging, as well as the aging of the U.S. population, will enhance the sales of skin care and sun care products.—*Leo McIntyre, Office of Basic Industries, (202) 377-0128, October 1990.*

Additional References

(Call the Bureau of the Census at (301) 763-4100 for information about how to order Census documents.)

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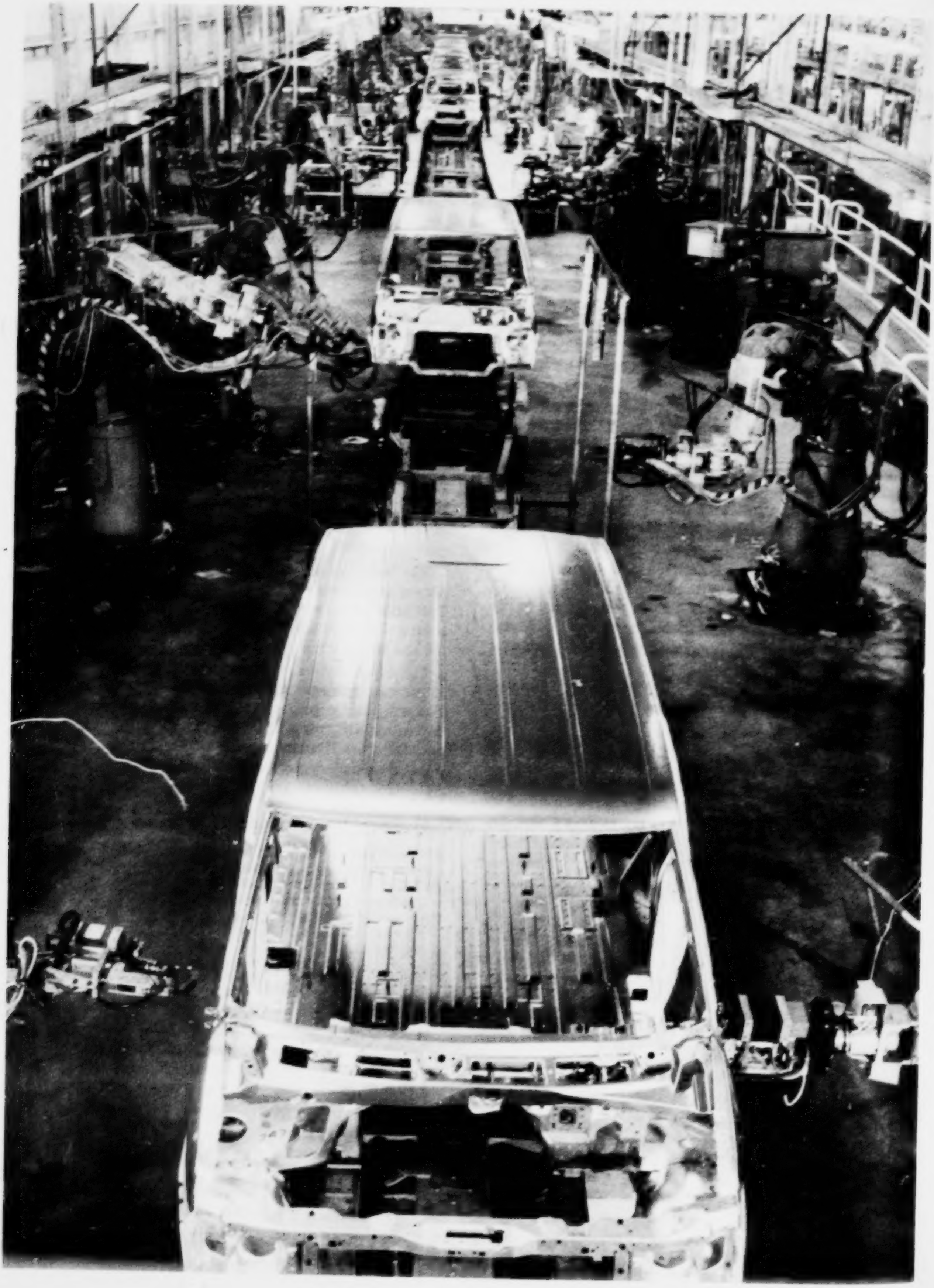

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Motor Vehicles and Parts

Total unit sales of passenger cars in the U.S. market will decline 2 percent in 1991, while unit sales of new trucks will advance by one-half percent. Constant dollar shipments for the six SIC industries defined as the motor vehicle parts industry are expected to decrease by 1.4 percent.

This chapter covers new, on-road, volume-produced completed vehicles for passengers or cargo (SIC 3711); and corresponding parts, components, and stampings (SICs 3465, 3592, 3647, 3691, 3694, and 3714). Before reading this chapter, please see "How to Get the Most Out of This Book" on page 1. It will clarify questions you may have concerning data collection procedures, factors affecting trade data, forecasting methodology, the use of constant dollars, the difference between industry and product data, sources and references, and the Standard Industrial Classification system (SIC). For other topics related to this chapter, see chapter 18 (Advanced Materials: Engineering Plastics).

The motor vehicles and parts industry is one of the largest sectors in the U.S. economy, accounting for approximately $215 billion of the nation's $5.2 trillion GNP in 1989, or 4.1 percent of the total. The industry invested $12.4 billion in new plants and equipment in 1989, and paid $37.6 billion in wages and salaries to its 843,000 employees. While firms earned a net $1.5 billion in 1988, intense competition in the market resulted in the industry suffering a pre-tax loss of $1.9 billion in 1989, the first loss since 1982. Industry revenues have grown slowly for the past several years, the result of a modest increase in current dollar personal consumption expenditures for motor vehicles and equipment. These expenditures rose 1.4 percent from $212 billion in current dollars in 1988 (excluding services) to $214 billion in 1989, but declined by 0.3 percent in constant dollar terms.

The increase over the past decade in the number of foreign firms participating in the domestic market, particularly those establishing local subsidiaries, has profoundly affected the entire industry, from the smallest parts supplier to the largest vehicle manufacturer. The struggle for market share between the Big Three—General Motors (GM), Ford, and Chrysler—and the new entrants has resulted in heightened quality, new products, and shortened development cycles. As a result, consumers could choose from among 567 different car models in 1990. The U.S. industry is estimated to have invested an additional $11.7 billion in new plants and equipment during 1990 to further improve its competitive position.

INTERNATIONAL TRANSACTIONS

International transactions are a major characteristic of this industry. Foreign subsidiaries of U.S.-owned motor vehicle and parts firms generated a total of $5.1 billion in repatriated income in 1989, while U.S. subsidiaries of foreign vehicle and parts firms repatriated $243 million. U.S. repatriated earnings in 1988 were $4.6 billion, compared to $64 million repatriated by foreign firms.

The numerous cooperative ventures between the Big Three and foreign firms are indicative of the globalization of the industry. General Motors, for example, uses its Chevrolet network to market Geo nameplate cars throughout the country. Chevrolets are made in the United States, Canada, and Mexico. The Geo line includes compact sedans made in California in a 50-50 joint-venture between General Motors and Toyota; subcompact and sport-utility vehicles made in Canada in a 50-50 joint venture between GM and Suzuki; and a sport compact made in Japan by Isuzu. Mazda builds Ford-badged cars in Japan for the Japanese market and in Michigan for the U.S. market, while Ford builds a version of its own sport utility vehicle in Kentucky for Mazda to market in the United States under the Mazda label. The Chrysler-Mitsubishi 50-50 joint venture in Illinois builds variations of one car that is sold in the United States by both companies. Although the Big Three own shares of Japanese auto companies, no Japanese company owns any equity in the Big Three.

The United States recorded a negative automotive trade balance of $51.4 billion in 1989 (see Trade Patterns Table), 80 percent of which was due to trade with Canada and Japan. The United States exports more parts than vehicles ($13.8 billion vs. $12.3 billion) and imports more vehicles than parts ($58.8 billion vs. $18.7 billion).

U.S. Exports and Imports
Motor Vehicles and Parts and Car Bodies
(in millions of dollars except as noted)

SIC	Industry	1989	1990[1]	1991[2]	Percent Change 1989-90	Percent Change 1990-91
	Automotive Parts & Accessories					
	Value of exports	13,837	13,145	12 500	−5.0	−4.9
	Value of imports	18,729	17,718	16 830	−5.4	−5.0
3711	Motor vehicles and car bodies					
	Value of exports	12,345	15,961	18,195	29.3	14.0
	Value of imports	58,840	65,583	70,830	11.5	8.0
Motor Vehicles and Parts and Car Bodies						
	Value of exports	26,182	29,106	30,695	11.2	5.5
	Value of imports	77,569	83,301	87,660	7.4	5.2

[1] Estimate
[2] Forecast
SOURCE: U.S. Department of Commerce: Bureau of the Census, International Trade Administration (ITA). Estimates and forecasts by ITA.

U.S. Trade Patterns in 1989
Motor Vehicles, Parts and Car Bodies
SIC 3465, 3592, 3647, 3691, 3694, 3711, 3714
(in millions of dollars, percent)

Exports			Imports		
	Value	Share		Value	Share
Canada & Mexico	19,251	73.5	Canada & Mexico	30,712	39.6
South America	461	1.8	South America	1,037	1.3
European Community	1,565	6.0	European Community	9,016	11.6
East Asia NICs	1,087	4.2	East Asia NICs	2,295	3.0
Japan	764	2.9	Japan	31,135	40.1
Other	3,054	11.7	Other	3,374	4.3
World Total	26,182	100.0	World Total	77,569	100.0

Top Five Countries

	Value	Share		Value	Share
Canada	16,516	63.1	Japan	31,135	40.1
Mexico	2,735	10.4	Canada	27,507	35.5
Japan	764	2.9	West Germany	6,763	8.7
Taiwan	764	2.9	Mexico	3,205	4.1
West Germany	676	2.6	South Korea	1,758	2.3

See "How to Get the Most Out of This Book" for definitions of the Country Groupings.

SOURCE: U.S. Department of Commerce: Bureau of the Census, International Trade Administration (ITA).

Exports of both vehicles and parts are expected to increase measurably over the next few years, while the rate of growth in imports may be slowed by more competitive U.S. products and by additional local production by foreign manufacturers. Some foreign-owned firms are not only exporting models made by their U.S. subsidiaries, but are also acquiring distribution rights in their home markets for Big Three products. Honda, for example, will distribute Chrysler's Jeep/Eagle line throughout Japan beginning in 1991. U.S. parts producers are also discovering that the products they make as original equipment for foreign vehicles manufactured in the United States, and for the retail aftermarket, have excellent export potential.

PASSENGER CARS

Total sales of all automobile manufacturers operating or marketing in the United States were 9.5 million units in 1990. This estimated decrease of 4.5 percent continued the pattern represented by a 6.7 percent drop in 1989. The market softened in part due to manufacturers having "purchased" 1990 sales in 1989 with major incentive programs. Also contributing to the slump was a sharp decline in consumer confidence in the latter part of 1990, in anticipation of a downturn in the economy. The University of Michigan's consumer confidence index for September reached the lowest level since the economic recession in 1982. Sales are not expected to increase before the second half of 1991.

The industry's sales are distributed among 10 U.S. manufacturers—GM, Ford, Chrysler, and joint ventures or subsidiaries of seven Japanese companies—and 20 foreign firms with marketing operations in this country. Of the Japanese-owned manufacturers in the United States, four facilities are wholly Japanese owned, including one joint venture involving two independent Japanese firms; and three are joint ventures, one with each of the Big Three. All manufacturers located on U.S. soil import cars from their own foreign plants and sometimes from other manufacturers, including from their competitors. Sometimes the same car is sold under different nameplates.

The Big Three

In an effort to remain major players in the U.S. market, the Big Three are investing heavily in new manufacturing facilities and technology to improve the quality of their vehicles. In response to the sales slump, the Big Three are also spending heavily for dealer and buyer incentives and for advertising. Shifting brand loyalties; the growing demand for minivans, sport-utility, and other niche vehicles, most of which require new platforms; and the switch in focus by Japanese manufacturers from low-end, low-profit to high-value vehicles are additional challenges for U.S. automakers.

The emergence of Third World automakers has added a new competitive force to the low end of the market. Thus the Big Three continue to face stiff competition in this segment. Consequently, it will be difficult for them to regain the overall domestic market shares that they enjoyed in the past. While the Big Three had record profits between 1986 and 1989, most of that came from foreign operations and automobile financing, and these profits are now decreasing. The Big Three earned $8.4 billion in 1989 on their worldwide sales of $258 billion, but only $3.1 billion in the first half of 1990 on worldwide sales of $124 billion.

U.S. Subsidiaries of Japanese Automakers

Honda, Japan's third largest automaker, began manufacturing autos at a facility adjacent to its Ohio motorcycle

Trends and Forecasts: Motor Vehicles and Car Bodies (SIC 3711)
(in millions of dollars except as noted)

Item	1987	1988[1]	1989[2]	1990[2]	1991[3]	Percent Change 1987–88	1988–89	1989–90	1990-91
Industry Data									
Value of shipments[4]	133,346	142,060	144,030	140,130	141,251	6.5	1.4	−2.7	0.8
Value of shipments (1987$)	133,346	140,690	138,413	133,263	131,505	5.5	−1.6	−3.7	−1.3
Total employment (000)	284	250	249	237	223	−12.0	−0.4	−4.8	−5.9
Production workers (000)	236	213	210	197	185	−9.7	−1.4	−6.2	−6.1
Average hourly earnings ($)	17.33	18.65	19.21	19.79	—	7.6	3.0	3.0	—
Capital expenditures	4,121	1,128	—	—	—	−72.6	—	—	—
Product Data									
Value of shipments[5]	130,857	140,703	142,590	138,729	139,839	7.5	1.3	−2.7	0.8
Value of shipments (1987$)	130,857	139,346	137,314	132,209	130,470	6.5	−1.5	−3.7	−1.3

[1] Advance data from the 1988 Annual Survey of Manufactures.

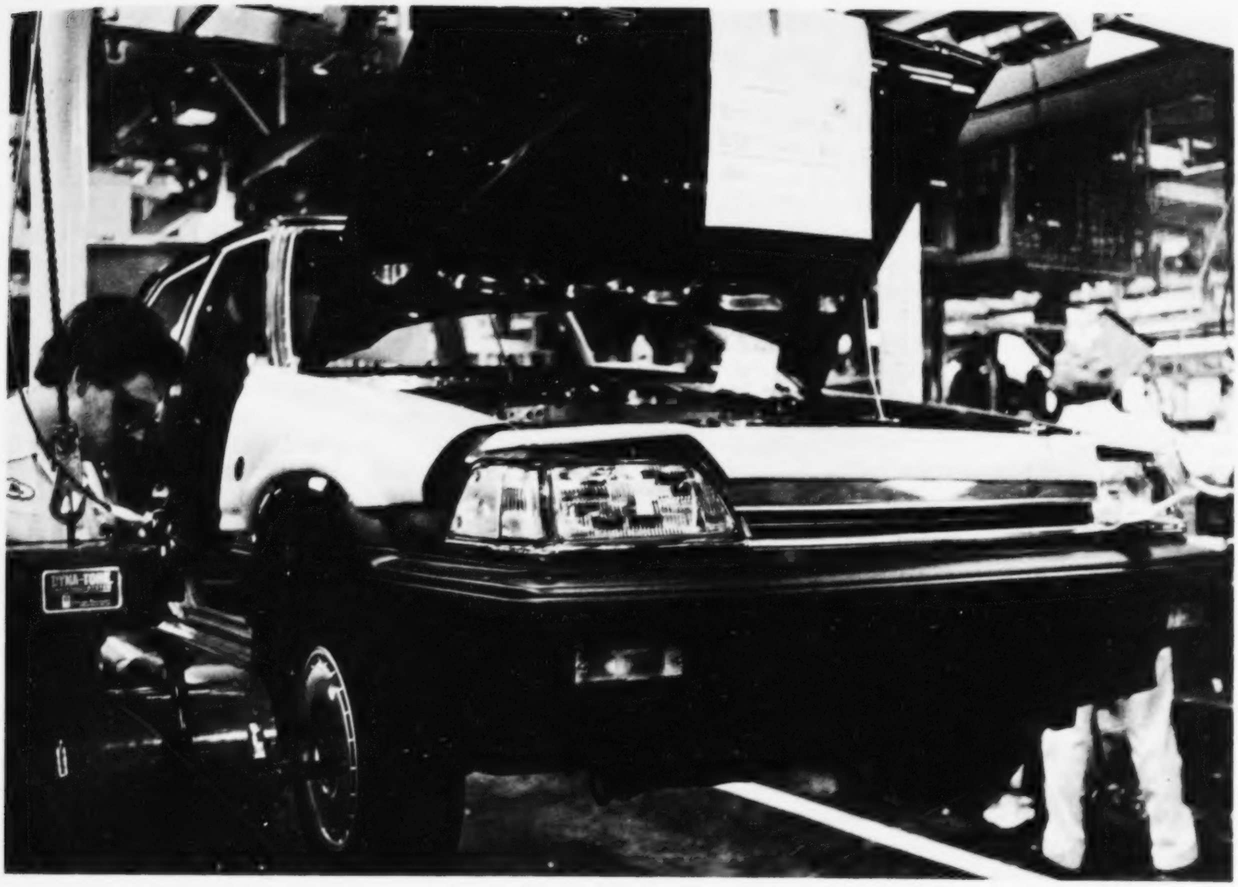
[2] Estimate.

[3] Forecast.

[4] Value of all products and services sold by establishments in the motor vehicles and car bodies industry.

[5] Value of products classified in the motor vehicles and car bodies industry produced by all industries.

SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA). Estimates and forecasts by ITA.



Honda of America Manufacturing, Inc.

Japanese automakers are increasing their production in the United States. Here, wheels are installed on a Honda Civic at Honda's plant at Marysville, Ohio.

factory in 1982. Nissan initiated U.S. production in 1985, Toyota in 1986, Mazda in 1987, and Mitsubishi, in partnership with Chrysler, in 1988. A Subaru-Isuzu plant, the only all-Japanese joint venture in the United States, began production in 1989. By the end of 1989, Japanese facilities accounted for 16.6 percent of U.S. domestic production, including units produced for their U.S. partners. By the end of 1990, these plants were collectively expected to gain another 5 percentage points of total domestic production.

Japanese investment in car and light truck assembly, stamping, and foundry facilities in the United States totaled $6.4 billion in 1989, providing an annual capacity of 1.6 million vehicles, and employment for 25,000 workers. Several Japanese firms expect to make additional investments that will increase their total U.S. production capacity to about 2.4 million cars and light trucks per year by 1992. Suzuki, Honda, and Toyota (and the Korean manufacturer, Hyundai) also produce in Canada for the United States market.

INTERNATIONAL COMPETITIVENESS

Import units brought into the United States by foreign and U.S.-owned firms rose from 26.7 percent of the U.S. market in 1980 to 33.3 percent in 1989, a new high. Total imports from Japan, including shipments to the Big Three, accounted for an overall market share of of 21.2 percent in 1980. These imports rose to a high of 24.7 percent in 1989. At mid-1990, imported vehicles comprised 25.8 percent of the passenger car market. Imports from Japan accounted for 18.4 percent of sales.

An analysis of import versus domestically sourced production, however, obscures the shift in overall market share between U.S. and foreign-owned firms. The Big Three's overall share dropped 4.8 percentage points between 1980 and 1989, to 67 percent. (Each point of the total new car retail market was worth about $1.5 billion in 1989.) At mid-1990, their share was 66.3 percent, compared to 69.5 percent in mid-1989. Japanese-owned firms increased their share 8.2 points, to 28 percent, in the 1980–1989 period; and at mid-year 1990 their share was 26.8 percent, compared to 23.7 percent at mid-year 1989. Japanese-nameplate cars produced in the United States are estimated to have totaled 1.2 million units in 1990, up 20 percent from 1989. Units made in the United States by the Big Three are estimated to have declined 19 percent to 4.6 million for the year.

The U.S. new car trade deficit in 1989 was $34.6 billion, a 10 percent decline from 1988. The deficit for the first six months of 1990 was $18.4 billion. U.S. exports totaled $9.9 billion in 1989, with $6.2 billion in shipments to Canada, the traditional leading market for American cars, accounting for 62 percent of the total. In 1988, shipments to Taiwan exceeded shipments to Saudi Arabia, making Taiwan the second leading market for U.S.-made cars; in 1989, shipments to Taiwan advanced an additional 36 percent to reach $706 million. Saudi Arabia's imports from the United States fell 9 percent in 1989 to $357 million, placing that country in fifth place, behind West Germany (up 43 percent to $371 million) and Japan. The value of shipments to Japan have increased sharply, rising 65 percent to $472 million between 1988 and 1989. The value of all U.S. passenger car shipments to Japan increased 33 percent in the first quarter of 1990 over the same period in 1989.

Currency revaluations, reduced taxes, and relaxed import regulations have played a role in increasing Japan's intake of imported cars, particularly in the luxury segment of the market. According to the Japan Automobile Importers Association, Japanese registration of Big Three vehicles made in the United States totaled 11,197 units in the first 9 months of 1990, an increase of 6 percent over the first 9 months of 1989. Japan also registered 9,132 Japanese nameplate vehicles made in the United States during the same period, an increase of 97 percent. Japan registered a total of 166,401 foreign-made passenger cars during the period, an overall increase of 33 percent.

Japan remains by far the leading source of U.S. imports, $20.2 billion in 1989, up 1.4 percent from 1988. The resulting $19.7 billion bilateral deficit accounted for 57 percent of the total U.S. auto trade deficit. Other leading suppliers in 1989 were Canada, $12.9 billion; West Germany, $5 billion; South Korea, $1.6 billion; Sweden,$1.6 billion; and Mexico, $1.2 billion. Imports totaled $44.5 billion for the year.

The worldwide operations of the U.S.-owned vehicle manufacturers place these companies among the world's largest vehicle producers, ranking first, second, and seventh in 1989, according to *Automotive News* estimates. General Motors produced 7.9 million cars and trucks worldwide in 1989 (8.1 million in 1988), including 3.2 million in the United States. *Automotive News* estimates that GM's 1989 share of worldwide production was 16 percent. Ford produced 6.4 million units worldwide (6.5 million in 1988), including 1.7 million in the United States. Ford's world share in 1989 was 13 percent. Chrysler's 1989 production of 2.4 million units (2.6 million in 1988), including 1.6 million in the United States, generated a 4.8 percent share of the world market.

GM owns 38 percent of Isuzu and 5 percent of Suzuki. Ford owns 25 percent of Mazda, and Chrysler has a 12 percent share of Mitsubishi Motors. In addition, the Big Three recently made several acquisitions and joint investments in Europe, to increase their worldwide competitiveness. GM and Ford already operate highly successful subsidiaries in Western Europe, and may be considering Eastern European ventures. Chrysler sold its Western European subsidiaries in the 1970s, but in March 1990 initiated a joint venture in Austria to produce minivans for the European markets. All three have significant manufacturing and marketing operations in both Canada and Mexico. While the Big Three have undertaken several joint ventures with Japanese manufacturers in this country, there is no direct foreign investment in GM, Ford, or Chrysler by foreign auto manufacturers.

Outlook for 1991

Automobile sales in early 1991 are expected to continue the decline that began in 1989, and then pick up towards year end to achieve total sales of 9.3 million cars. Tables 1 and 2 give estimates and forecasts of passenger car sales in the United States from 1989 through 1995. Key assumptions include a low economic growth rate through the first half of 1991 that recovers over the balance of the period; slow growth in personal disposable income; a modest inflation rate; slightly higher interest rates, tighter loan qualification standards, and higher downpayments; a lower rate of job creation; and increased costs of vehicle ownership and operation. Japan's voluntary export restraint program

Table 1: Automobile Sales in the U.S. Market By Segment and Source 1989–95

(in thousands)

Vehicle Category and Source	1989	1990[1]	1991[2]	1992[2]	1993[2]	1994[2]	1995[2]
TOTAL	9,954	9,500	9,300	9,700	10,100	10,300	10,500
SMALL	2,366	2,096	2,213	1,959	1,838	1,751	1,743
North American[3]	950	1,029	1,085	980	919	893	889
Captive Imports[4]	198	186	243	196	180	166	159
Japanese Imports	794	573	686	588	551	497	479
European Imports	25	23	22	20	18	19	24
Other imports	400	286	177	176	169	175	192
COMPACT	3,554	3,091	3,534	3,880	4,040	4,223	4,305
North American[3]	2,243	2,089	2,368	2,607	2,755	2,910	3,031
Captive Imports[4]	533	400	459	504	485	507	474
Japanese Imports	671	524	601	660	687	697	689
European Imports	70	68	71	70	73	68	68
Other imports	35	10	35	39	40	42	43
INTERMEDIATE	2,211	2,408	1,795	1,921	2,020	2,060	2,100
North American[3]	1,974	2,023	1,522	1,627	1,709	1,745	1,783
Japanese Imports	112	230	154	167	180	183	187
European Imports	125	154	118	127	131	132	130
LARGE/LUXURY	1,823	1,906	1,758	1,940	2,202	2,266	2,352
North American[3]	1,472	1,463	1,369	1,562	1,781	1,835	1,882
Japanese Imports	156	196	204	227	264	295	346
European Imports	195	247	185	151	156	136	125

[1] Estimate.

[2] Forecast.

[3] American and foreign manufacturers producing in North America for the U.S. market.

[4] Japanese-made for sale by American manufacturers.

SOURCE: Base data by *Wards' Automotive Reports*. Estimates and forecasts by U.S. Department of Commerce, Office of Automotive Industry Affairs. See text for underlying assumptions.

will have no significant impact on market share because of increased production by Japanese-owned plants in the United States.

Total U.S. imports of Japanese automobiles are expected to increase to 2.3 million units in 1991. Japanese nameplates will significantly expand their presence in the small, compact, and luxury market segment, relying on a mix of imported units and increased local production. The compact segment will continue to be the fastest growing segment of the traditional passenger car market. It has risen a 27.8 percent share in 1982 to 32.5 percent in 1990 and should reach a 38 percent share in 1991. Intermediate car sales will decline in 1991 as cost-sensitive consumers switch to more fuel-efficient, small, and compact cars.

The realignment of the dollar against the major currencies in Europe (down 10 to 20 percent against the German mark, French franc, Swedish krona, and Italian lira from mid-89 to mid-90) will have a marked impact on the sales of large and luxury class European cars in the U.S. market in 1991. European large/luxury sales have already been particularly hard hit by currency shifts, falling 26 percent between 1985 and 1989. In addition, new luxury Japanese models began entering the United States in the fall of 1989. Their excellent reputation will develop further during 1991, placing the Europeans under even more pressure. Big Three divisions that depend heavily on the large/luxury segment of the market also have been affected by Japanese luxury vehicles, but not to the extent originally anticipated. Their new and restyled luxury models should help them retain market share.

The Big Three's well established, wholly-owned foreign subsidiaries and their numerous foreign joint ventures diminish the possibility that Big Three unit exports from the United States will become significant in the near term. As demonstrated by their advancing success in Japan, however, the value of their exports may increase as they more aggressively pursue foreign niche markets for high-value luxury and sports models.

Long-Term Prospects

The expected slow growth of the economy; increased traffic congestion; and proposed more stringent emissions, fuel economy, and safety regulations may dampen demand for automobiles in the long term. These factors could significantly reduce consumer confidence, while raising the cost of owning and operating motor vehicles. Moreover, fewer citizens will reach driving age in the next ten years than in the past decade, slowing overall market growth. The negative impact on automakers' profits could be offset somewhat, however, by the baby boom generation's entry into what has typically been the age bracket in which people tend to own more expensive cars and more of them.

The cost of vehicle ownership has been steadily increasing since the recession of the early 1980s, and will take a greater percentage of disposable income, both for initial purchase and for operating and maintenance expenses. Many people can no longer afford to trade for a new car every 3 or 4 years, or choose not to, and are extending their loan periods to keep monthly payments low. They will have to keep their vehicles longer before trading them, to avoid owing more on their loans than the vehicles are worth. The increased lifespan of most new automobiles, a result of market pressures for improved quality, will make consumers more comfortable with owning their vehicles for longer periods.

Running counter to the extended loan trend, are consumer leasing programs, which are likely to increase in the next several years. Leasing can reduce the sting of initial rapid depreciation, while making possible lower downpayments or shorter "ownership" periods. Leasing is becoming more popular as lenders tighten up on auto loans. Between 1980 and 1988, the average maturity for auto loans increased every year, rising from 45 to 56.2 months. In 1989 this contracted to 54.2 months. Average monthly payments rose to $292 from $276 in 1988, and from $184 in 1980. Unless leasing takes on a greater and more flexible role than anticipated, however, the market will remain stretched out with longer sales cycles than in the past.

The result of all of these factors will be lower unit sales annual growth rates in the 1990s than in the 1980s. The average transaction price will escalate, however, so that total dollar sales will continue to rise, except if gasoline prices increase to more than $2.00 a gallon. If that happens, the public could again tilt toward more efficient, less expensive vehicles, which are generally less profitable for the manufacturers.

Because so many manufacturers are active in the United States and world markets, the struggle for both domestic

Table 2: Automobile Sales and Market Shares in the United States, 1989-95

Source	1989	1990[1]	1991[2]	1992[2]	1993[2]	1994[2]	1995[2]
SALES (thousands)	9,954	9,500	9,300	9,700	10,100	10,300	10,500
North American	6,639	6,604	6,344	6,776	7,165	7,383	7,584
Imports, Total	3,315	2,896	2,956	2,924	2,935	2,917	2,916
Japanese-made	2,465	2,109	2,348	2,342	2,347	2,345	2,333
American nameplates	731	586	703	700	665	673	632
Japanese nameplates	1,733	1,523	1,645	1,641	1,682	1,672	1,701
European	415	491	396	368	379	355	348
Other imports	435	296	212	215	210	217	235
MARKET SHARES (percent)							
North American	66.70	69.52	68.21	69.85	70.94	71.68	72.23
Imports, Total	33.30	30.48	31.79	30.15	29.06	28.32	27.77
Japanese-made	24.76	22.20	25.25	24.14	23.24	22.77	22.22
American nameplates	7.34	6.17	7.56	7.22	6.58	6.54	6.02
Japanese nameplates	17.41	16.03	17.69	16.92	16.66	16.23	16.20
European	4.17	5.17	4.26	3.79	3.75	3.44	3.32
Other imports	4.37	3.11	2.28	2.22	2.07	2.11	2.24

[1] Estimate
[2] Forecast

SOURCE: Base data by *Wards' Automotive Reports*. Estimates and forecasts by U.S. Department of Commerce, Office of Automotive Industry Affairs. See text for underlying assumptions.

and foreign sales will intensify. The automobile markets of the United States, Japan, and Western Europe are rapidly maturing, precipitating fierce struggles simply to maintain market share. In the near term, moreover, new participants will enter the international arena, offering additional, and by some estimates, excess manufacturing capacity. In the United States, each tenth of a point of market share will be vigorously contested. Complicating the situation for U.S. manufacturers, producers from Eastern Europe, Russia, India, Malaysia, and Thailand have expressed interest in entering the U.S. market. While they may win many initial sales, they may find, as South Korea and Yugoslavia did when they entered the U.S. market with subcompacts in the late 1980s, that sales drop off rapidly if quality and cost advantage are not maintained.

In the 1980s, the Big Three reestablished their competitiveness vis-a-vis the Japanese automakers. As shown in Table 3, the entire community of automakers significantly improved the quality of its products between 1986 and 1990. Consumers rank cars by U.S. automakers as having improved the most—23 percent. Asian cars improved 13 percent, and European cars improved 17 percent. However, product quality is no longer a feature by which to gain sales in the United States, but is rather a minimum requirement for protecting market share.

Table 3: Consumers' Evaluation of Automobile Quality

Origin	1986	1987	1988	1989	1990
Asian	119	119	122	130	135
European	106	102	110	111	124
Domestic	94	98	102	112	116
Overall	100	104	108	118	122

SOURCE: J.D. Power & Associates, Consumer Satisfaction Index.

While the market share battle may exert downward pressure on prices, more stringent safety, environmental, and fuel economy regulations will increase manufacturer costs, and generate upward pressure. Manufacturers will thus be under additional pressure to maximize productivity and keep costs under control.

Labor relations will become increasingly important to the industry as a way to improve quality and productivity. Vehicle assembly is becoming more vulnerable to disruption by isolated strike activities as the low parts inventory manufacturing process being implemented by most manufacturers allows for no cushion if supplies are disrupted. GM, for example, idled more than 20,000 parts and assembly workers for several days in August 1990 because of a lack of components caused by a 6-day strike at a GM parts plant. The firm lost the production of 19,000 light trucks and sport utility vehicles.

At the same time, labor content is becoming a less significant cost to U.S. manufacturers, as it is offset by robots and other high-tech processes, as it is in Japan. Even if exchange rates stabilize, therefore, and even though the technology for the manufacture of low-tech subcompact cars is easily duplicated in Third World countries, foreign-based manufacturers seeking to compete solely on the basis of price may lose their edge. The trend towards off-shore manufacturing of low-tech vehicles for the U.S. market by local producers may peak quickly for the same reason.

In addition to offering their own finance and leasing programs, manufacturers are attempting to combat the stretchout in the U.S. sales cycle by introducing revised models more frequently. "Niche" models that appeal to small market segments representing 25,000 to 50,000 sales per year, will be pursued more vigorously to help extract sales from a slow market. This strategy will require more flexible manufacturing techniques, and it will place a heavier burden on product planners, market researchers, design and production engineers, and styling studios. Manufacturers will also need to improve cost controls, to extract profits from lower production volumes.

Internationally, there will be more cross-border mergers, takeovers, and cooperative production and marketing arrangements between firms in the United States, Europe, and Asia. There will be fewer, more equally matched global contestants, who will compete primarily with locally-based production in three major marketing areas: Europe, North America (the United States, Canada, and Mexico), and the Asian Pacific Rim (APR).

Japanese-owned plants will operate in all three regions, and American-owned plants in North America and Europe. European auto manufacturers will remain centered on that continent. Vehicle shipments from Europe to the United States, especially of upscale and sports vehicles, will remain significant. Shipments to the APR countries will increase, primarily from Japanese-owned facilities in North America and Europe. Honda, Toyota, and Mazda already ship certain models to Japan and Taiwan from their plants in the United States, and may intensify their efforts within two years. Honda, Nissan, Toyota, and Subaru have also expressed interest in exporting U.S.-built units to Europe. U.S. and European imports from the APR region may decrease, replaced by local production by foreign manufacturers.

The sudden access to prospectively huge new markets in Eastern Europe (137 million people, but only 21 million vehicles), and the U.S.S.R. (287 million people, 25 million vehicles) will not significantly divert competitive pressure from the American market. The Big Three's primary competitors are well financed and capable of mounting separate efforts in both regions. Further, even though U.S. manufacturers cannot afford to ignore these opportunities (estimated in Eastern Europe alone to be worth 1.5 million units annually by 1995, and 2 million by 2000, compared to 1 million units in 1990), this may leave them strapped for cash until those markets become profitable. The timetable for advances in the East European markets could be slowed by the region's new exposure to international oil pricing. Those countries can no longer count on automatic access to stabilized, subsidized Soviet oil.

In addition, EC92 is expected to stimulate the West European auto market. EC92 is the merger of 12 Western European countries, which constitute a single market of 325 million people with a Gross Domestic Product of $4.5 trillion and a 1988 per capita income of $13,770. Although not expecting to be fully operational until 1992, the EC member countries are already gearing up for competition with other world markets, and are debating ways to open their markets to foreign auto manufacturers.—*Randall Miller, Office of Automotive Industry Affairs, (202)377-0669, October 1990.*

TRUCKS

Sales in 1990 of all truck classes totaled about 4.7 million vehicles, off 5 percent from last year. Instead of overcoming the 5 percent sales decline in 1989, as most observers at first anticipated, the industry settled into a shallow retrenchment. The 1990 decline was primarily caused by uncertainty about oil prices and by consumers and commercial buyers losing confidence in the economy in the second half of the year. Total unit sales increased from 2.5 million units in 1980 to a total of 5.2 million units in 1988. Projected U.S. truck production in 1990 reached only 3.9 million units.

Sales trends vary considerably among the weight classes. Sales of light duty vehicles, which includes classes 1 and 2 (up to 10,000 pounds of allowable gross vehicle weight, GVW), and class 3 (10,001 to 14,000 pounds GVW), dipped 4.8 percent in 1990 to 4.4 million units. The decline mirrored the decrease in passenger car sales, for which light trucks (vans, pickup trucks, and sport-utility vehicles) are increasingly used as substitutes. This substitution is partly a function of price, partly of changing tastes and lifestyles. Since these vehicles tend to be less fuel efficient than cars, however, increasing gasoline prices contributed significantly to reducing demand. Class 1 and 2 sales, dependent almost entirely on consumer purchases, were down 3 percent through August 1990 to 2.8 million units, according to *Ward's Automotive Reports.* Sales of compact passenger vans, which had grown 25 percent a year between 1982 and 1988, showed only 1 percent growth in 1989, and then grew to 16.7 percent in the first 8 months of 1990.

The popularity of the newly designed class 3 vehicles continues to grow, especially among commercial buyers; sales reached 13,800 units through August, a 10.5 percent increase from August 1989. Classes 4 through 7 (14,001 to 33,000 pounds GVW), the medium-weight group, are designed only for commercial buyers. Sales in these classes at the end of August were 6.5 percent behind sales from August 1989. In class 8 trucks (33,001 GVW and over), stiffer emission laws were expected to pull a large number of sales of 1991 models into 1990, but sales of these trucks instead fell 16.8 percent through August 1990, to 83,400 units.

The quality of light trucks produced by the Big Three has increased significantly in the past several years, as the companies applied their passenger car quality improvement programs to their truck lines. Ford began production in 1990 of a badge-engineered light pick-up truck for sale in the United States as the Mazda Navajo, the first instance of a Japanese manufacturer purchasing a vehicle from a U.S. supplier for sale in the United States. Nissan has designed a new small passenger van which Ford will soon begin manufacturing in the United States for sale by both manufacturers.

Imported units supplied 19 percent of the total U.S. truck market in 1980. In 1989, imports accounted for 11 percent of the market, and for 12.6 percent in the first seven months of 1990. While the import share of light trucks (12.9% as of July 1990, compared to 12.8% in the first seven months of 1989) has increased only slightly, local production by foreign-owned firms is also significant.

Comparable data on the import market share for medium and heavy trucks are not available, as many imported vehicles are sold with a U.S. nameplate and are not listed separately in industry data. Official U.S. trade data, which group vehicles according to the product categories of the international harmonized tariff system, confirm that imports of light and heavy trucks have increased for the past several years and are now a significant portion of total domestic sales. Data from the Motor Vehicle Manufactur-

General Motors

Light trucks, including vans, pickup trucks, and sport-utility vehicles, are increasingly used as substitutes for passenger cars. The import share of compact light trucks is expected to decline as U.S.-owned manufacturers become competitive in price and quality.

ers Association (MVMA), which monitors much of the industry, indicate that imports, including complete knock-down units assembled in the United States, comprised 12.5 percent of the U.S. class 4 through 7 market through August 1990, but just 0.1 percent of the class 8 market.

Prospects for the U.S. light truck market continue to be bright. Helped by decreases during 1986-88 in the value of the dollar vis-a-vis the yen, U.S.-based producers have been capturing record market shares in compact light pickup trucks. Their share of the U.S. market increased to 87 percent through July 1990, up from 68 percent in July 1989 and 64 percent in July 1988.

In 1990, eight foreign and U.S-owned firms competed for a share of the lucrative 4.4 million unit class 1 and 2 market, while 12 firms, some of whom also sell class 1 and 2 vehicles, competed in classes 3 through 8 for the 300,000 units estimated to have been sold last year. This intense level of competition should result in further consolidation of the industry.

U.S.-owned medium and heavy truck producers are competing vigorously with imports and the new foreign-owned entrants into the U.S. market, many of whom rely on sales in other strong markets to support their efforts in the United States. In 1990, 100 different models of class 3 to 7 commercial trucks were available on the U.S. market, sold under 14 nameplates. According to Motor Vehicle Manufacturer Association data, U.S.-owned makers supplied 73.2 percent of combined class 3, 4, and 5 sales through August, 89 percent of class 6, and 95 percent of class 7, selling a mix of domestic and imported vehicles.

Sales of medium-duty trucks increased steadily from 1984 through 1988, but in 1989 declined in most classes. For 1990, based on data supplied by *Ward's Automotive Reports*, only sales in classes 3 and 4 are estimated to have increased from their 1989 levels. Over the past few years, only class 3 and class 4 did not experience a decline in sales in any year. Both classes are relatively new to the market. As recently as 1983, only 145 class 3 trucks were sold in the United States. Sales exceeded 19,000 units in 1989 and reached an estimated 22,000 in 1990. In 1986, no class 4 trucks were sold domestically; by 1989, there were more than 27,000 sales, and an estimated 31,000 thousand in 1990.

Class 3, 4, and 5 trucks were once known as the "phantom" class. U.S. manufacturers produced only a few each year while independent aftermarket converters would upgrade class 2 pickup truck and van suspensions and drive trains to carry payloads equal to the higher classes. The low volume kept costs high, and the engineering modifications did not always yield a satisfactory product. Because European and Japanese manufacturers produce standard specification models specifically for similar weight classes for their home markets, they enjoy tremendous economies of scale. Consequently they are finding a ready market in the United States. Seven foreign firms with U.S. manufacturing operations now sell models assembled here, plus units imported from abroad. Five other firms export to the United States, most having entered from Japan in the past 5 years.

Until the entry of foreign suppliers, class 6 and 7 trucks were mainly supplied by GM, Ford, and International Harvester (now Navistar). To meet competitive pressures, U.S.-owned firms have sought to reduce costs by manufacturing in countries with low labor costs; by increased out-sourcing of components and vehicles; and by seeking higher volumes by selling in additional markets. To implement this strategy, Ford initiated production of a new model in Brazil in 1985 for sale in South and North America. The company had difficulty controlling costs, however, and in 1990 moved all production of its Cargo truck to Kentucky. U.S. production started in 1990, and imports are to be terminated by the end of 1991. In spite of Brazil's inflation and exchange problems, PACCAR continues to import Brazilian-assembled trucks from AutoLatina, the VW-Ford joint venture, for sale by its Kenworth and Peterbilt divisions.

Iveco, an import market pioneer in classes 3 to 6, plans to withdraw from the U.S. market by the end of 1991, citing increased competitive pressures, stiffer emission regulations, and a lack of sufficient sales to warrant further effort. After 10 years, Iveco was selling imported and locally assembled trucks at an annual rate of about 2400 units. Since many manufacturers sell fewer than 1,000 units a year—the minimum number needed for making a profit in medium trucks—it is likely that more firms will vacate the market.

Volvo bought White Motor's heavy truck operation in 1981, and later merged it into its 1988 U.S. joint venture with General Motors. GMC owns 24 percent of Volvo GM Heavy Truck Corporation. Volvo owns the balance and provides the active management of the company. In 1990, the company completed an expansion of local plant capacity. In 1981 Daimler-Benz bought Freightliner, a major U.S. producer of class 8 trucks, from Consolidated Freightways. In 1990, D-B created additional U.S. plant capacity to build class 6 and 7 vehicles. Before its purchase, Freightliner imported class 6 to 8 trucks from Volvo. Renault purchased 46% of Mack Truck in 1985. In 1990, Renault agreed to buy the remainder of the firm, and to purchase Mack engines for use in one of its new European models. Both actions should contribute significantly to a reversal in fortunes for this firm.

Deregulation during the early 1980s greatly increased productivity in the heavy trucking industry, resulting in a large reserve of low-mileage class 8 tractors that finally will have accumulated sufficient mileage and age (over 6.5 years on average in 1990) by the end of 1991 to require replacement. Fleet operators have just about fully cannibalized surplus vehicles for parts to extend the life of other units. Moreover, excess capacity and increased competition have depressed freight rates, encouraging both for-hire and private fleets to reduce operating costs by replacing inefficient units with better performing new equipment. Canadian and Mexican deregulation of their trucking industries, and simplification of border crossing regulations, could spur growth of U.S. trucking firms and contribute to strong long-term demand for new equipment.

In the past, class 8 heavy truck sales were dominated by individual owners and small fleet operators who based purchasing decisions on personal preferences and casual judgments of near-term earning potential, making annual industry sales difficult to forecast. This pattern is beginning to change. Large shipping lines, and private fleets owned by manufacturing firms, now dominate the market. They manage their trucks as assets with a finite economic life, and time their additions and replacments to generate the highest possible long-term return. Consequently, general manufacturing activity, capital goods investments, and overall fleet age are better indicators of prospective truck sales than in the past.

INTERNATIONAL TRADE

U.S. exports of new trucks totaled $2.8 billion in 1989, an increase of 3.7 percent over 1988. Canada remained the leading market for U.S. exports, accounting for $2.2 billion in 1989. France ranked second with $55 million, followed by Saudi Arabia at $41 million, West Germany at $39 million, and Mexico at $28 million.

Imports held steady at $9.9 billion in 1989, yielding a deficit of $7.1 billion. Some of the apparent stall in imports reflected in official trade statistics was due to the Treasury Department's decision that 4-door light trucks can enter as passenger cars, subject to a 2.5 percent import duty assessment rather than to the 25 percent collected on 2-door light trucks. Imports of newly designed four-door light trucks have increased significantly in response to shifting market demand. The leading import suppliers in 1989 for all classes of trucks were Canada, $6.5 billion; Japan, $2.9 billion; Mexico, $138 million; France, $95 million; and Brazil, $84 million.

In the first six months of 1990, exports of U.S.-made trucks totaled $1.4 billion, while imports amounted to $4.6 billion. If the second six months matches the first, it would produce a decline of 10 percent in the deficit by the end of 1990. A weakening domestic market, rather than an increased volume of exports, accounts for this improvement.

European analysts believe that the EC's deregulation of the trucking industry, including the allowance of cabotage (the hauling and delivery of freight within one country by a foreign trucking firm) will vastly improve productivity and temporarily reduce demand for new trucks. This expectation is driving efforts to consolidate the European truck manufacturing industry. For example, Volvo and Renault are swapping equity, and Ford is discussing the possibility of some form of cooperative venture with Fiat for their worldwide commercial truck operations. Ford and Fiat combined their heavy-truck ventures in the U.K. in 1986. Consolidation is also influencing European industry's efforts to become larger players abroad, including in the United States.

Three large American-owned class 8 firms, Navistar, PACCAR, and Ford, supply 55 percent of the U.S. market. With the exception of Canada, the Middle East, and Australia, their export efforts are not significant. Despite the fact that U.S. trucks are considered highly competitive, efforts to penetrate the EC market have met with only limited success, due primarily to exceedingly high duties that range between 17 and 22 percent of a vehicle's landed value. Moreover, since value-added taxes are charged on the dutied value, they can add as much as an additional 5 percent to the vehicle's price.

Exports prospects nearer to home appear to be improving. During the 1960s, Mexico sought to block the possibility of imports taking over its market by encouraging foreign truck firms to manufacture there. To enhance the local industry's prospects, the Government offered attractive investment incentives, and imposed outright prohibitions on certain imports, as well as high import duties, content requirements, and price controls. In 1990, Mexico began voluntarily dismantling its trade restrictions on trucks which could eventually result in greater U.S. shipments to that country.

Outlook for 1991

Truck sales in 1991 are expected to continue to decline in the first half of the year, but should pick up in the latter half if the economy revives, as expected. By the end the year, sales should total about 4.72 million units. Table 4 shows the forecast for 1991 through 1995.

The strongest segments by volume will be class 1 and 2 compact passenger vans and multipurpose sport-utility vehicles. Growth in light trucks may be tempered in early 1991, however, because of higher fuel prices and the application of passenger-car safety standards and stricter emissions standards to these vehicles. Tighter emissions standards could reduce fuel efficiency and cause prices of light gasoline-powered trucks to rise faster than passenger car prices, reducing their appeal as substitutes for cars.

The medium and heavy segments will experience strong growth beginning mid-year, stimulated by new offerings, replacement of worn-out equipment, and increased fuel costs that will make new, more fuel efficient diesel trucks more economically attractive. Demand will not be sufficient to stem the ongoing consolidation of the medium and heavy truck sector, however. Some firms will leave the market, while additional international mergers and cooperative ventures could also occur.

Table 4: Retail Truck Sales Forecast, 1989–95

(in thousands of units)

Year	Classes	Light 1-3	Medium 4-7	Heavy 8	Total
1989		4,630	167	145	4,942
1990[1]		4,410	163	126	4,699
1991[2]		4,409	180	131	4,720
1992[2]		4,444	190	136	4,770
1993[2]		4,522	210	138	4,870
1994[2]		4,557	212	141	4,910
1995[2]		4,638	215	147	5,000

[1] Estimate.

[2] Forecast.

SOURCE: Base data by Motor Vehicle Manufacturers Association. Estimates and forecasts by U.S. Department of Commerce, Office of Automotive Industry Affairs.

Imports of both completed and knocked down, locally assembled trucks will continue to gain market share in 1991. Gains will be particularly strong in medium-duty trucks, classes 4 to 6, and could arise in class 8 trucks by year end.

Long-Term Prospects

Light Truck Sector

Overall class 1 and 2 truck sales will advance modestly for the next several years, mirroring developments in the passenger car industry. Numerous new product offerings, coupled with increased availability of established popular models, will generate more competition in the compact passenger van market. This increased competition comes at a time when this market is beginning to peak. The new four-door sport-utility vehicles are expected to gain market share at the expense of two-door sport-utility vehicles, minivans and traditional station wagons. Because of their novelty and increasing popularity, all sport-utility vehicles could increase 20 percent between 1990 and 1992, far more than anticipated growth for other personal vehicles. Sales were up 10 percent in the first 8 months of 1990 over the same period of 1989.

The import market share of compact light trucks is expected to decline further as U.S.-owned manufacturers become more competitive in price and quality. Also, more foreign production of light trucks, requiring new plant facilities, is being brought on-shore, further contributing to an erosion in imports.

Medium and Heavy Truck Sectors

Sales of medium trucks, especially in classes 3 and 4, will increase rapidly as their usefulness for local delivery and service industries becomes more recognized. A strong upturn in diesel-engine medium truck sales is possible in 1993 as customers purchase these trucks before new environmental regulations for diesels take effect in 1994. Federal regulations may also be amended to require anti-lock brake systems. Both actions could significantly raise new vehicle prices, and buyers could place orders in 1993 to avoid the price increase. Some diesel emission regulations may tighten further in 1996, possibly stimulating sales again in 1995.

Class 8 manufacturers in the U.S. market are pursuing major programs to redesign cabs to make driving and sleeping accommodations more pleasant for drivers; to redesign drivetrains to accommodate more trailer height and payload; and to increase fuel economy by reducing vehicle dimensions and weight, reducing aerodynamic drag, and improving engine performance, all while meeting new emission regulations. Their efforts are complicated by the fact that the industry traditionally has been geared to the custom manufacturing of units, assembling one vehicle at a time with various combinations of in-house and outside-sourced engines and drivetrain components as specified by individual customers.

If the domestic economy begins to improve by mid-1991, the anticipated upturn in class 8 truck orders should continue for the next few years. Nonetheless, the long-distance trucking industry is grappling with depressed profits, increasing fuel costs, and shortages of both drivers and repair technicians, making buyers very particular and demanding.

It will be difficult for U.S.-owned manufacturers to take advantage of the economies of scale that European and Japanese manufacturers enjoy in their standardized, relatively high volume home markets. Foreign firms are moving into the U.S. market to exercise their competitive advantages, buying into and strengthening existing firms, or setting up their own import and local assembly operations.

Not yet major players in the American class 8 market, Japanese firms have built large U.S. dealer networks to handle their medium weight trucks. These trucks have been well received, and the Japanese are expected to try to penetrate the class 8 market in the next several years. *—Randall Miller, Office of Automotive Industry Affairs, (202) 377-0669, October 1990.*

AUTOMOTIVE PARTS AND ACCESSORIES

The U.S. automotive parts industry includes producers of automotive stampings (SIC 3465); pistons, rings, etc. (SIC 3592); vehicle lighting equipment (SIC 3647); storage batteries (SIC 3691); engine electrical equipment (SIC 3694); and automotive parts and accessories (SIC 3714).

The industry is mature, with two major components: the original equipment (OE) market and the aftermarket. Industry shipments of U.S. parts from 1987 to 1989 were relatively stable, registering an average annual growth rate of 1.8 percent. Estimated 1990 shipments fell, however, to about $98.4 million in constant dollars, down about 1.1 percent from $99.4 million in 1989.

There are about 4,400 automotive parts firms in the United States, including 168 recently established Japanese-owned firms. The largest U.S.-owned parts producers are subsidiaries of the Big Three and account for 40 percent of total sales. Four large independent U.S. suppliers are responsible for another 10 percent, and small and medium suppliers for the remainder. The industry accounts for a significant, relatively stable level of domestic employment. Estimated 1990 industry employment was 618,000, including about 491,000 production workers, a 4 percent dip from 1989.

U.S. sales of OE parts, historically supported by a fairly stable, high level of domestic vehicle sales, have been on the decline since 1988, due mainly to the drop in domestic passenger car sales, which fell from 10 million units in 1989 to an estimated 9.5 million in 1990. The demand for domestic OE parts has also been limited by foreign sourcing. Some U.S. vehicle firms source components from abroad to change the composition of vehicle fleets for purposes of calculating compliance with Federal fuel economy requirements. Vehicles with less than 75 percent domestic content are excluded from the manufacturers' domestic fleet for CAFE (corporate average fuel economy) purposes.

The U.S. auto parts aftermarket, a traditional source of industry strength, has become one of the weaker components of the total parts market. Industry sources estimate that the total retail aftermarket in 1990 was about $98

Trends and Forecasts: Automotive Parts and Accessories (SIC 3465, 3592, 3647, 3691, 3694, 3714)

(in millions of dollars except as noted)

Item	1987	1988[1]	1989[2]	1990[2]	1991[3]	Percent Change 1987-88	1988-89	1989-90	1990-91
Industry Data									
Value of shipments[4]	92,292	98,796	103,049	103,327	103,256	7.0	4.3	0.3	−0.1
Value of shipments (1987$)	92,292	97,278	99,440	98,362	96,954	5.4	2.2	−1.1	−1.4
Total employment (000)	637	636	637	618	581	−0.2	0.2	−3.0	−6.0
Production workers (000)	509	510	510	491	467	0.2	0.0	−3.7	−4.9
Average hourly earnings ($)	13.98	14.65	—	—	—	4.8	—	—	—
Capital expenditures	4,116	3,345	—	—	—	−18.7	—	—	—
Product Data									
Value of shipments[5]	88,640	94,501	98,571	98,974	98,935	6.6	4.3	0.4	−0.0
Value of shipments (1987$)	88,640	93,215	95,314	94,285	92,948	5.2	2.3	−1.1	−1.4

[1] Advance data from the 1988 Annual Survey of Manufactures.

[2] Estimate.

[3] Forecast.

[4] Value of all products and services sold by establishments in the automotive parts & accessories industry.

[5] Value of products classified in the automotive parts & accessories industry produced by all industries.

SOURCE: U.S. Department of Commerce: Bureau of the Census, International Trade Administration (ITA). Estimates and forecasts by ITA.

billion, with $75 billion spent on parts and $23 billion on service. Do-it-yourself parts spending accounted for $30 billion, and professional shops accounted for the rest.

Three main factors have contributed to the recent decline in aftermarket parts demand:

- A greater number of newer vehicles are on the road. Motor Vehicle Manufacturers Association (MVMA) data indicate that, although consumers have been keeping cars longer, the number of vehicles scrapped annually has been increasing. Also, since 1986, the median age of passenger cars on the road has fallen from 7.0 to 6.5 years, thus reducing the need for replacement parts.
- Increasingly well designed and engineered OE parts, such as spark plugs and shock absorbers, are lasting longer and thus reducing demand.
- Specific diagnostic technologies can more accurately identify parts that are likely to fail, which has reduced the practice of replacing parts routinely to head off trouble.

Significant Japanese investment in both U.S. vehicle and parts plants is an important factor in the U.S. parts market. The demand for domestic OE parts has increased with U.S. production of Japanese nameplate cars—1.25 million produced in 1990 alone. As of June 1990, about 168 Japanese companies had invested in 245 U.S. parts plants; 126, or 51.4 percent, are wholly owned subsidiaries of Japanese firms, and 119, or 48.6 percent, are joint ventures. Joint venture partners include 74 non-Japanese partners, mostly American. Early Japanese investment in auto parts tended to be in the production of such bulky items as tires, seats, and air-conditioning equipment, which are costly to ship. Increasingly, however, investment leans toward such higher value-added and more diverse parts as engines and drive train components.

Plastics

The use of plastic parts in the auto industry has increased steadily over the past 5 years, due to their lighter weight, lower production cost, and rust and dent resistance. Federal CAFE requirements have encouraged original equipment manufacturers to use plastics to reduce vehicle weight, which helps increase fuel efficiency. Use of plastics becomes more practical as niche vehicles are produced in lower-volume production runs. Shorter lead times and lower break-even points are possible with plastics because the molds to produce plastic parts are easier to use than metalworking dies. The industry expects a steady increase in plastic use for body panels, frame, structural members, and even parts under the hood. Plastics, ceramics, composites, and silicones will be used increasingly in the 1990s, and plastics industry analysts estimate that plastics use in the automotive industry will increase 38% by the year 2000.

INTERNATIONAL TRADE

International trade accounts for an increasing share of the auto parts market for both U.S. and foreign manufacturers. A 1990 industry survey revealed that of 74 U.S. parts companies with combined revenues of $15 billion, 55 percent expected that this trend would continue and that more than 10 percent of their sales would come from outside North America in 5 years.

Estimated 1990 U.S. imports of motor vehicle parts amounted to $17.7. billion, down about 5 percent from 1989. The majority of imports were captive, representing shipments from Big Three-owned foreign facilities, most in Canada or Mexico; or shipments by Japanese auto companies to their U.S. affiliates.

Estimated 1990 U.S. exports of motor vehicle parts totaled $13.1 billion, down about 5 percent from 1989. The major destinations for U.S. parts exports were Canada, Mexico, and the EC, with Canada and Mexico accounting for nearly 80 percent of the total.

Estimated 1990 auto parts trade data reveal that the balance of trade with Japan has improved slightly since 1989. Some industry experts believe the moderate increase in purchases from traditional U.S. auto-parts suppliers by Japanese-owned U.S. plants has been a precursor for U.S. exports to Japan.

U.S. auto parts exports to the EC have risen steadily since 1985, enabling many U.S. firms to establish themselves in Western Europe, the third-largest purchaser of U.S. parts. As internal trade barriers in the EC are eliminated, many U.S. firms are taking advantage of developing sales opportunities by establishing links with agents, and by investing directly in plants and facilities. Industry sources indicate that German reunification is providing new market opportunities. During 1990, developments in Eastern Europe, particularly in Czechoslovakia and Yugoslavia, promised new markets for both new and used equipment.

Outlook for 1991

U.S. auto parts firms expect slow growth for 1991. The industry is mature, the OEM segment is uncertain, and the aftermarket is likely to be weak. OE parts sales are likely to be slow because of the expected slight decline in passenger car sales, which is predicted to decrease slightly below its 1990 level of 9.5 million units, to 9.3 million units in 1991. Constant dollar industry shipments for 1991 are predicted to drop to $97 million, down 1.4 percent from 1990. The export market offers the best hope for sales stability, but even that market has political and economic uncertainties.

Most U.S.-based Japanese-owned vehicle assembly plants have announced plans to increase their "domestic content" (U.S. value added) to 75 percent by 1991. Domestic parts suppliers, to increase sales to these plants, will have to deliver quality products in a timely fashion, control costs, and work with the autoworkers to improve design. Exceptional performance in these areas could lead to increased integration of U.S. parts suppliers into the Japanese vehicle production network and open the way to direct sales to Japanese plants in Japan and the United States.

In light of recent high-level trade negotiations between the United States and Japan, the prospects for continued increases in auto parts exports are good. The MOSS (Market-Oriented, Sector Selective) talks, and other U.S. Government- and industry-sponsored initiatives, continue to open Japan to competitive U.S. parts firms willing to commit the necessary resources to the Japanese market. Most recently, the MOSS process produced an agreement on a Market-Oriented Cooperation Plan (MOCP) to increase opportunities for U.S. companies with Japanese automotive manufacturers. Elements of the MOCP include cooperation between Japanese and U.S. parts firms in the design and development phases of production; expansion of U.S. and Japanese infrastructure and information services to facilitate business contacts; coordination of Japan's import programs with U.S. export programs; resolution of specific trade issues; review of Japanese company plans to expand U.S. sourcing and business relations with U.S. parts suppliers; and price and market surveys to monitor competitiveness. The U.S. and Japanese Governments are currently discussing implementation of the program.

Increased sales opportunities may also unfold as EC92 unifies the European market, and as Eastern Europe opens to Western trade and investment. Standardized specifications and simplified commercial procedures in Europe will provide more market opportunities in an increasingly competitive environment.

Long-Term Prospects

In the long term, U.S. parts firms will focus on the increasingly open and competitive world market. As OEMs rely more heavily on their suppliers to provide not just parts, but innovative designs, they will look to parts manufacturers for new production processes and integrated component systems. The current trend towards incorporating complex, computer-based components in vehicles could provide the U.S. auto parts industry with a significant international competitive advantage.

Global automotive competition is stimulating automotive parts manufacturers to search for domestic and foreign market opportunities and to conduct expensive R&D on behalf of their OE clients. Those parts firms that make the effort to assist OEMs in meeting future technical and competitive requirements will have a significant competitive advantage.

An important factor for long-term health of the U.S. auto parts industry is the overall performance of the economy. The predicted slow growth, coupled with the continued rise in the cost of automobile ownership and the expected increase in vehicle life spans, may depress new vehicle sales and result in reduced OE parts sales.

The age of the vehicle fleet will significantly affect the health of the aftermarket. The median age of the fleet has peaked and is now falling. Age is an important determinant of aftermarket demand because the older the vehicles, the greater the need for parts. But better designed parts, better diagnostic technologies, and the greater number of newer cars on the road, may also dampen the demand for older vehicles.

Although recent setbacks in the Korean automotive industry have resulted in reduced opportunities for U.S. suppliers, long-term opportunities remain strong. Some recent increases in Korean import restrictions are expected to be temporary. Emerging automakers in Taiwan, Thailand and other regions of the Far East also offer promising markets.

Factors affecting access of U.S. parts makers to Japanese motor vehicle manufacturers, such as existing long-term relationships between Japanese suppliers and their customers, and fluctuating exchange rates, are critical to firms seeking sales to Japanese-owned businesses both here and abroad. The U.S. and Japanese Governments will continue to explore ways to increase business opportunities between the U.S. and Japanese motor vehicle industries.—*Dr. Robert O. Reck and Mary Ann Slater, Office of Automotive Industry Affairs, (202)377-1418, October 1990.*

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Household Consumer Durables

Combined product shipments of the household durable goods industries are expected to decline 2.0 percent in 1991, after adjustment for inflation. This decline reflects continuing decreases in shipments of household furniture (SIC 251) and household appliances (SIC 363), a slight decline in shipments of lawn and garden equipment (SIC 3524), and a 3 percent increase in shipments of consumer audio and video equipment (SIC 3651).

Before reading this chapter, please see "How to Get the Most Out of This Book" on page 1. It will clarify questions you have concerning data collection procedures, factors affecting trade data, forecasting methodology, the use of constant dollars, the difference between industry and product data, sources and references, and the Standard Industrial Classification system (SIC). For other topics related to the subject of this chapter, see chapter 5 (Construction), 6 (Wood Products), 39 (Personal Consumer Durables), and 40 (Retailing).

A number of factors point toward a continued pessimistic outlook for shipments of household durable goods in 1991. Consumer demand for these products is related to the housing market, demographics, relative prices, and disposable income growth. The timing of consumer spending on these products, however, is highly discretionary since these are deferrable purchases. Discretionary spending is related to such variables as consumer confidence, unemployment and fluctuations in the stock market. Most of these indicators took a turn for the worse in 1990 with little indication of improvement in 1991.

Housing starts—a key indicator of new demand for appliances, furniture, and lawn equipment—were down 37 percent in August 1990 from their previous peak in 1986. In 1990 alone, starts were off an estimated 10 percent and were expected to decline a further 6 percent in 1991. Other measures of the housing market were similarly depressed. The value of new single family construction, adjusted for inflation, declined an estimated 7 percent in 1990 and is expected to decline an additional 5 percent in 1991. New home sales and sales of existing homes also registered declines in 1990. The only bright spot in housing construction was spending on home improvements, which grew an estimated 4 percent in 1990 and is projected to grow 3 percent in 1991, in constant dollars. (For additional information about the construction industry, see chapter 5.)

The economic health of American consumers deteriorated on several fronts in 1990. Disposable personal income grew only 1.1 percent in constant dollars, based on first half 1990 data, following growth of 4.9 and 2.4 percent in 1988 and 1989, respectively. Disposable income growth is expected to slow even further in 1991 as employment growth stalls.

Worse for spending on consumer durables, consumer confidence faltered significantly in 1990 due to a number of factors led by the Iraqi invasion of Kuwait and the subsequent increase in oil prices. Other conditions contributing to consumer uncertainty were the prospect of higher taxes as a result of the proposed federal budget agreement, the slumping real estate market, problems associated with the savings & loan industry, and concern about similar weakness in the commercial banking industry.

In the third quarter of 1990, several indicators pointed toward a weakening economy and many economists raised their estimates of the likelihood of a recession. In August, the index of leading indicators declined 1.2 percent to 144.2 (1982 = 100). This index had been relatively flat since the third quarter of 1988. In September, the National Association of Purchasing Managers' composite index of manufacturing activity declined for the third month in a row, to 44.4 percent, its lowest level since December 1982. An index reading below 50 percent generally indicates a decline in manufacturing and a drop below 44 percent indicates a decline in the total economy, according to the association. Finally, three consecutive monthly increases in unemployment to 5.7 percent in September after remaining fairly steady at around 5.3 percent for nearly two years added to consumers' jitters about spending. Significantly, increases in the number of unemployed occurred across a wide range of sectors and types of workers, affecting white collar workers in particular.

Reflecting consumer uneasiness about the economy, the Conference Board Consumer Confidence Index (1985 = 100), which had peaked at 120.7 in February 1989, then stayed in the 110 to 120 range, declined from 110.5 in March 1990 to 101.7 in July. Following the Iraqi invasion of Kuwait, the Index plunged to 84.7 in August, its lowest level since the 1981-82 recession. The Board's measure of consumer expectations about future economic growth, which had turned more negative since the October 1987 stock market crash, took a similar nosedive in August.

Consumer uncertainty tends to increase savings. Personal saving as a share of disposable income increased from a historic low of 2.9 percent in 1987 to an estimated 4.9 percent in 1990. As a larger share of personal income is saved, less is available for spending. Another factor dampening consumer expenditures is consumer debt. Consumer installment debt as a percent of personal income peaked at 16 percent in September 1989; however, it continued at high levels throughout 1990. With credit markets tightening and consumers already carrying heavy debt loads, consumers will find it more difficult to obtain new credit and will be forced to pay down existing loans.

Increased spending on gasoline and other oil-related expenditures, such as heating oil will also cut into consumer spending on durable goods. The consumer price index jumped 0.8 percent in August, reflecting a 15.4 percent surge in fuel oil prices. With the price of oil reaching $40 a barrel in the fourth quarter of 1990, further increases in energy prices were expected. Any increase in taxes will further detract from consumer spending on durables.

Large movements in the stock market generally affect discretionary spending among the more-than one-fourth of households that owns stock, since it reflects changes in wealth. These consumers generally defer or scale down discretionary spending when the stock market declines significantly. By October 1990, the average value of the Dow Jones index of 30 industrial stocks had dropped more than 500 points, or 18 percent, from its peak in July.

It is estimated that personal consumption expenditures on all durable goods will decline 0.6 percent in 1991. However, the decline could be greater depending on the severity of downturns in the variables noted above and price increases resulting from the Persian Gulf crisis.

The one category of household durables expected to exhibit an increase in constant dollar domestic shipments in 1991 is audio and video equipment. The increase is primarily due to an expected increase in exports and decline in imports, reflecting the movement of foreign-owned manufacturing to the United States in recent years. The consumer electronics market is characterized by rapid innovation, thus creating new demand and making older technology obsolete. This characteristic tends to render consumer electronics less "durable" in the sense that their life cycle tends to be much shorter. Also, intense price competition and new technology have combined to make the relative price of consumer electronics extremely attractive to consumers.

Personal consumption expenditures (PCE) on consumer audio and video products, which includes tapes, recordings and musical instruments, have experienced tremendous growth in both absolute terms and as a share of total durable goods expenditures. Between 1970 and 1990, consumer electronic PCE went from 6.3 percent of total durables PCE to 16.4 percent. Meanwhile, furniture expenditures went from 9.7 to 6.7 percent of total durables and appliances declined from 7.7 to 7.1 percent. Much of this share gain can be attributable to price depreciation. The implicit price deflator for audio and video PCE stood at 75 percent of its 1982 level in 1989, while the appliance deflator was 1 percent higher than in 1982 and furniture prices were 17 percent higher.

INTERNATIONAL TRADE

Against this backdrop of declining domestic demand for household durables, increases in exports and reductions in imports have been bright spots. However, exports are still considerably below imports for all household durable industries except lawn and garden equipment. Furthermore, negative developments in 1990 are expected to slow the rate of deficit reduction in 1991. Combined U.S. exports of household durable goods are expected to increase 12 percent in 1991 to $5.3 billion, compared with a 15 percent increase in 1990. Meanwhile, imports are forecast to fall 3.0 percent to $18.2 billion, down from a 3.3 percent decrease in 1990.

U.S. Exports and Imports
Household Consumer Durables

(in millions of dollars except as noted)

SIC	Industry	1989	1990[1]	1991[2]	Percent Change 1989-90	Percent Change 1990-91
251	Household Furniture					
	Value of exports	440	680	880	54.5	29.4
	Value of imports	2,695	2,754	2,784	2.2	1.1
3524	Lawn and garden equipment					
	Value of exports	415	474	535	14.0	13.0
	Value of imports	111	140	134	26.1	−4.3
363	Household Appliances					
	Value of exports	1,581	1,800	2,000	13.9	11.1
	Value of imports	2,829	2,650	2,600	−6.3	−1.9
3651	Household audio and video equipment					
	Value of exports	1,739	1,826	1,917	5.0	5.0
	Value of imports	13,707	13,158	12,632	−4.0	−4.0
	Household Consumer Durables					
	Value of exports	4,176	4,780	5,332	14.5	11.6
	Value of imports	19,343	18,702	18,150	−3.3	−3.0

[1] Estimate.

[2] Forecast.

SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA). Estimates and forecasts by ITA.

On the positive side, foreign currency exchange rates for the U.S. dollar are expected to decline in 1991 for the second year, after rising somewhat in 1989. Real exchange rates are well below their peak achieved in 1985 making U.S. exports of durable consumer goods more competitive abroad and raising the price of U.S. imports.

The major export markets for household durables are Canada, Mexico, the Asian Newly Industrialized Countries (NIC's), the European Community (EC), and Japan. U.S. exports to Canada, accounting for 21 percent of total household durable exports, have benefited from declining tariffs as a result of the U.S.-Canada Free Trade Agreement. Mexico (20 percent of exports) has benefited from economic reforms at home and liberalizing its foreign trade and investment regime. In particular, the *maquilladora* program along its northern border has attracted investments from the consumer electronics, appliance and furniture industries. In radios and TVs, many of the investments are by foreign-owned companies, particularly Japanese. However, the investments in appliance and furniture *maquilladora* operations are largely U.S.-based. These *maquilladora* plants have increased bilateral trade with Mexico both ways—in greater exports of parts and greater imports of finished products.

Clouding the forecast for exports, however, are projections of slower economic growth in many of our major markets. The increase in oil prices has been cited as a major cause for revising foreign growth estimates downward. Canada reported a drop in its gross domestic product in the second quarter of 1990 and its prospects continue to be poor. Japan, which is totally dependent on foreign oil for its energy needs, recorded the lowest level of its stock index in three years in 1990. Still, Japan's economy is expected to record modest growth in 1991. The four Asian NIC's—Taiwan, Singapore, Hong Kong and South Korea—are all heavily dependent on Mideast oil and are expected to be adversely affected by the rise in oil prices. Still, these economies are expected to have positive rates of growth. In the EC, the Conference Board index of leading indicators showed economic growth in Europe continuing to rise, with Germany and France particularly strong. The United

U.S. Trade Patterns in 1989
Household Consumer Durables
SIC 251, 3524, 363, 3651
(in millions of dollars, percent)

Exports			Imports		
	Value	Share		Value	Share
Canada & Mexico	1,706	40.8	Canada & Mexico	2,584	13.4
South America	149	3.6	South America	246	1.3
European Community	569	13.6	European Community	707	3.7
East Asia NICs	539	12.9	East Asia NICs	7,642	39.5
Japan	288	6.9	Japan	7,013	36.3
Other	925	22.1	Other	1,151	5.9
World Total	4,176	100.0	World Total	19,343	100.0

Top Five Countries

	Value	Share		Value	Share
Canada	886	21.2	Japan	7,013	36.3
Mexico	820	19.6	Taiwan	2,333	12.1
Taiwan	306	7.3	South Korea	2,041	10.6
Japan	288	6.9	Mexico	1,866	9.6
United Kingdom	205	4.9	China	1,122	5.8

See "How to Get the Most Out of This Book" for definitions of the Country Groupings.

SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA).

Kingdom, however, has shown considerable weakness as a result of persistently high interest rates. The United Kingdom is the fifth largest foreign market for household durable goods exports.

U.S. imports of household durables will be hampered by the low value of the U.S. dollar and the expected weakness in the U.S. market for these products. Japan is the major supplier of these products in all four industry groups except furniture. Japan accounted for 36 percent of total imports of household durables in 1989. The second largest supplier, Taiwan, is the leading supplier of furniture and a major source of consumer electronics and appliances. Together with South Korea, the third largest supplier, it accounted for 23 percent of imports. However, these two countries have been losing share to Mexico, the fourth largest supplier with 10 percent of household durable good imports. Taiwan and Korea have experienced rising labor rates and the loss of duty-free status for these products. Meanwhile Mexico has benefited from internal economic reforms, relatively cheap labor, and duty-free access to the U.S. market. Additionally, a desire among Japanese and U.S. companies to locate production near the U.S. market also benefits Mexico.

Long-Term Prospects

The long term outlook for household consumer durables is more sanguine than the immediate forecast. Factors contributing to the more favorable outlook include a recovery from depressed levels of consumer spending, especially for furniture and appliances, the maturing of the baby boom generation, and continuing growth in international trade and investment. Challenges facing these industries include prospects for increased costs of government regulation and a slower growing work force which has become more diversified. These two trends, together with an improved economic climate in Mexico, may give some manufacturers reasons for setting up production south of the border.

As consumers have delayed purchases of household durables during the last few years, they have created a gap between desired and actual expenditures on these products. As variables reflecting the economic well-being of consumers improve—as for instance in personal income and housing—and consumer confidence is restored, this pent-up demand will be satisfied by fairly strong growth in expenditures, especially during the initial phase of the recovery.

In the longer term, the movement of the baby boom generation into its peak earning and spending years bodes well for manufacturers of household durable goods. According to the Bureau of Labor Statistics' 1988 Consumer Expenditure Survey, median income of households was highest among 45-54 year olds followed closely by the 35-44 age group. More importantly, spending on household durables by these age groups was also significantly higher. In 1988, average annual expenditures on house furnishings and equipment was $1,469 for households headed by 45-54 year-olds and $1,357 for the 35-44 age group, compared to $1,083 for all households. According to the Census Bureau, the 45-54 age group will grow at a compound annual rate of 4.2 percent between 1990 and 1995, much faster than the total population growth of 0.8 percent. This faster growth reflects the leading edge of the baby-boomers entering their late-forties. The 35-44 age group will also be growing rapidly, at a 2.2 percent annual rate, to 42 million people by 1995.

The aging of the population will not only mean large numbers of middle-aged consumers with greater purchasing power, but also a trend by these consumers to trade up to higher quality products with more features. Examples would be CD players, high quality loudspeakers, and large screen TVs in the electronics segment or riding lawn mowers in the lawn and garden market. Furthermore, according to a survey financed by the real estate industry, demand for second homes may surge in the 1990s as baby boomers move into the age group that typically buys vacation homes. According to the survey, the highest rates of vacation-home ownership are among households headed by 45-54 year-olds. Such a trend would tend to offset somewhat the declining number of first-time home buyers, typically those in the 25-34 age group. The shrinking of this age group along with higher housing prices are reasons given for lower projected levels of housing activity in the 1990s than occurred in the 1970s and 1980s.

Another positive trend for the household durable industries in the 1990s will be greater access to foreign markets and expected continuing declines in the value of the dollar. U.S. exports of household durables are expected to continue expanding, barring a major worldwide economic downturn. In 1990, the United States and Mexico agreed to enter negotiations for a Free Trade Agreement, creating the prospect of an integrated North American free trade area. With Canada and Mexico already the leading markets for U.S. exports of household durables, U.S. exports should benefit further from the elimination of tariffs and non-tariff measures. The Uruguay Round of multilateral trade negotiations was scheduled to be completed by December 1990. Household durable goods exporters stand to benefit from increased market access in both the developed and developing country markets. The unification of the European Community Market in 1992 is expected to benefit U.S. exporters by eliminating national barriers to trade. Finally, the economic and political reforms in Eastern Europe and the Soviet Union may create additional opportunities for U.S. exports or, more likely for consumer durables, investment.

One of the challenges facing household durable goods manufacturers will be increased costs of production due to government regulations and a changing labor market. Since these costs raise prices to consumers relative to other goods and services and relative to foreign manufacturers' prices, shipments of household durable goods will be negatively affected. The furniture industry faces higher costs of meeting new standards for wood dust exposure required by the Occupational Safety and Health Administration. Under proposed revisions to the Clean Air Act, the furniture industry faces regulation of finishing emissions. The appliance industry must meet new standards for refrigerator energy efficiency and both the appliance and furniture industries must find suitable replacements for chlorofluorocarbons, used in refrigerator coolants and in foam production for upholstered furniture. Pending legislation concerning copyright protection has limited the introduction of digital audio tape systems into the U.S. market. Another bill introduced in 1990 would require all new TV sets of a certain size to be capable of closed-caption transmissions for the hearing impaired.

The baby bust generation—those born in the late 1960s and early 1970s, will result in a decline in the 15-24 age group, from 36.1 million in 1990 to 35.0 million by 1995. Combined with growing numbers of workers expected to retire, the decline of new workers entering the work force has led the Bureau of Labor Statistics to project growth in the U.S. work force of only 1.2 percent during the 1990s compared with 2.0 percent between 1976 and 1988. The resulting shortage is likely to bid up wages as employers attempt to attract the most qualified workers.

Another factor affecting manufacturers' human resources costs is the changing composition of the work force. A greater number of educationally disadvantaged workers entering the work force will cause manufacturers to focus on training them as a means of developing qualified workers in order to remain competitive. In addition, new sets of issues have arisen as women, single-parent and dual-income families comprise a larger share of the work force. Nearly half the work force is comprised of women. The number of women in the work force is expected to increase from 56.7 million in 1990 to 61.7 million in 1995. The Labor Department also reports that there are 7.6 million working mothers with children and 25.4 million two-earner families. As a result, there is increased interest in requiring employers to provide more family-related benefits including child care, parental/family leave, and health care. Household durable manufacturers who want to effectively compete for and retain qualified workers in an increasingly competitive labor market will need to develop innovative approaches to address these issues.—*Kevin Ellis, Office of Consumer Goods, (202) 377-1176, October 1990.*

HOUSEHOLD FURNITURE

The household furniture manufacturing industry (SIC 251) encompasses producers of wood (SIC 2511), upholstered (SIC 2512), and metal (SIC 2514) furniture, as well as bedding (SIC 2515), and miscellaneous furniture (SICs 2517 and 2519). In 1990, the value of household furniture industry shipments was estimated to be $19.6 billion, a constant dollar decline of 4.2 percent from 1989. The shipment decline is a downstream reflection of recent declines in residential construction, which usually leads trends in domestic industry shipments. Moreover, cautious consumption patterns—the result of the Persian Gulf crisis, rising energy prices, thrift industry problems, and a declining real estate market in much of the country—negatively affected household furniture shipments in 1990 as well.

In periods of economic uncertainty, furniture purchases, like other highly discretionary acquisitions, are often postponed. A larger share of personal income is devoted to nondurable goods expenses—utilities, food and clothing—by nature less discretionary. This proposition translated into declining demand for household furniture throughout the year. Further, declining consumer demand for finished products coincided with rising manufacturing costs (utilities, raw materials, wages), which put added pressure on industry profitability.

With the prospect of continuing energy price increases through the fall and winter seasons, coupled with predictable consumer anxieties associated with mobilizing and deploying U.S. military troops overseas, already conservative consumers became even more apprehensive late in the year. As a result, by the last third of 1990, the Conference Board's consumer confidence index had dropped to its lowest level since 1983.

Overall employment in the household furniture manufacturing industry averaged 275,000 last year, a decline of 1.9 percent from 1989. Production worker employment totaled 232,000, a decline of 1.7 percent from the previous year. Among the various industry segments, upholstered household furniture manufacturing experienced the only employment gain last year, less than one percent. The increase was attributed to a tripling of upholstered furniture exports.

The wood household furniture manufacturing segment registered employment declines of 3.1 percent for all employees and 4.2 percent for production workers. Given the importance of wood furniture manufacturing to industry trends, these declines were responsible for much of the overall employment reduction in the household furniture manufacturing industry.

Average weekly hours of employment have decreased, usually a sign of a downturn in this industry. From 1987 through 1988, average weekly hours were above 39. However, by 1989, it was right at 39. Through the first seven months of 1990, the average was 38.3, and estimated to remain at that level—or lower—the remainder of the year.

Hourly wages for the household furniture industry reached $7.84 in 1990, an increase of only 2.8 percent from 1989—below inflation. This modest increase compares to an increase of 4.1 percent in 1989, and a compound annual growth rate of 4.5 percent through all of the 1980s.

INTERNATIONAL COMPETITIVENESS

U.S. Imports

As growth in the domestic housing market and related furniture purchases continues to stagnate, international trade has become ever more important to U.S. manufacturers of household furniture. Indeed, "globalization" is

Trends and Forecasts: Household Furniture (SIC 251)

(in millions of dollars except as noted)

Item	1987	1988[1]	1989[2]	1990[2]	1991[3]	Percent Change 1987–88	1988–89	1989–90	1990–91
Industry Data									
Value of shipments[4]	18,557	19,098	19,631	19,576	—	2.9	2.8	−0.3	—
2511 Wood furniture, house	7,980	8,256	8,467	8,501	—	3.5	2.6	0.4	—
2512 Upholstered furn, house	5,263	5,409	5,560	5,642	—	2.8	2.8	1.5	—
2514 Metal furniture, house	2,141	2,214	2,318	2,201	—	3.4	4.7	−5.0	—
2515 Mattresses & bedsprings	2,417	2,456	2,481	2,499	—	1.3	1.0	0.7	—
Value of shipments (1987$)	18,557	18,363	18,222	17,463	17,096	−1.0	−0.8	−4.2	−2.1
2511 Wood furniture, house	7,980	7,893	7,754	7,444	7,288	−1.1	−1.8	−4.0	−2.1
2512 Upholstered furn, house	5,263	5,195	5,201	5,069	4,963	−1.3	0.1	−2.5	−2.1
2514 Metal furniture, house	2,141	2,151	2,177	2,008	1,966	0.5	1.2	−7.8	−2.1
2515 Mattresses & bedsprings	2,417	2,368	2,297	2,233	2,186	−2.0	−3.0	−2.8	−2.1
Total employment (000)	284	283	280	275	—	−0.4	−1.1	−1.8	—
Production workers (000)	241	241	238	232	—	0.0	−1.2	−2.5	—
Average hourly earnings ($)	6.98	7.33	7.63	7.84	—	5.0	4.1	2.8	—
Capital expenditures	377	373	—	—	—	−1.1	—	—	—
2511 Wood furniture, house	197	212	—	—	—	7.6	—	—	—
2512 Upholstered furn, house	76.9	84.9	—	—	—	10.4	—	—	—
2514 Metal furniture, house	37.7	28.0	—	—	—	−25.7	—	—	—
2515 Mattresses & bedsprings	34.2	20.2	—	—	—	−40.9	—	—	—
Product Data									
Value of shipments[5]	17,813	18,313	18,830	18,777	—	2.8	2.8	−0.3	—
2511 Wood furniture, house	7,454	7,701	7,925	7,957	—	3.3	2.9	0.4	—
2512 Upholstered furn, house	4,912	5,045	5,187	5,265	—	2.7	2.8	1.5	—
2514 Metal furniture, house	1,955	2,034	2,123	2,017	—	4.0	4.4	−5.0	—
2515 Mattresses & bedsprings	2,694	2,713	2,740	2,759	—	0.7	1.0	0.7	—
Value of shipments (1987$)	17,813	17,586	17,471	16,743	16,391	−1.3	−0.7	−4.2	−2.1
2511 Wood furniture, house	7,454	7,355	7,264	6,974	6,827	−1.3	−1.2	−4.0	−2.1
2512 Upholstered furn, house	4,912	4,832	4,843	4,722	4,623	−1.6	0.2	−2.5	−2.1
2514 Metal furniture, house	1,955	1,977	1,988	1,834	1,794	1.1	0.6	−7.7	−2.2
2515 Mattresses & bedsprings	2,694	2,613	2,537	2,466	2,414	−3.0	−2.9	−2.8	−2.1

[1] Advance data from the 1988 Annual Survey of Manufactures.

[2] Estimate.

[3] Forecast.

[4] Value of all products and services sold by establishments in the household furniture industry.

[5] Value of products classified in the household furniture industry produced by all industries.

SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA). Estimates and forecasts by ITA.

the latter-day term often associated with the evolution of interest in international trade during the 1980s. However, through the early to mid years of the decade (1980–86), the term could only have been identified with the extraordinary growth rate in U.S. imports, 21.8 percent compounded annually. While the rate of growth of household furniture imports had diminished to 7.2 percent annually in the latter half of the decade, it was still higher than the 4.3 percent growth rate for domestic shipments. Furthermore by 1990, U.S. imports of household furniture had captured a significant share of the American market—amounting to $2.8 billion and accounting for over 13 percent of apparent consumption.

Taiwan, the leading foreign supplier of household furniture during the decade—particularly of wood and metal furniture items—captured a one-third share of total U.S. imports in 1989 and 1990. Italian manufacturers and exporters supplied over half of U.S. imports of upholstered furniture products last year, and thus maintained their overall standing as America's second largest overseas source for household furniture imports. With a focus on furniture products which retail at higher prices—items often incorporating unique designs and beautiful upholstery—the Italians' niche in the U.S. market seems secure.

Canada continued to be an important supplier of wood, upholstered, and metal furniture products. It ranked third as a source of imported household furniture in the United States in 1990. However, the value of Canadian household furniture exports to the United States was less than the value of its imports from America.

U.S. Exports

By the latter third of the decade, "globalization" had come to mean that U.S. household furniture producers were also looking overseas for new marketing opportunities as well as for sourcing imports. In 1987, industry exports grew by 20.2 percent over the previous year; in 1988 by 38.3 percent; in 1989 by 49.5 percent; and in 1990 by an estimated 54.5 percent, to $680 million. Nonetheless, compared to levels of domestic shipments and imports, household furniture exports are still relatively modest—3.6 percent of the industry's domestic product shipments in 1990, up from 2.3 percent in 1989, and 1.0 percent in 1986.

Larger manufacturers often enjoy marketing clout and economies of scale that together provide an important competitive edge in the international arena. As a result, furniture industry consolidation in the 1980s positioned many of the newly created or expanded companies—particularly those with brand identification—for active global marketing in the 1990s.

Canada

During the first half of 1990, U.S. exports of household furniture to Canada rose 38 percent and were expected to perform well through the fall and winter seasons as well. With the U.S.-Canada Free Trade Agreement (FTA) in its second year, Canadian tariffs on household furniture imports from the United States were reduced to 9 percent compared to their Most Favored Nation (MFN) rate of 15 percent. The rates are scheduled to be reduced by 3 percentage points each year—reaching 6 percent in 1991, and 3 percent in 1992—until they are removed altogether in January 1993.

Canadian household furniture exports to the United States have declined each year since the bilateral trade agreement was implemented. In fact, the furniture industry trade press reported that after several Canadian firms went out of business due to an economic slowdown coupled with rising shipments from U.S. suppliers, the Canadian Council of Furniture Manufacturers (CCFM) was considering a formal request that their Government activate emergency measures under the FTA which would reimpose the MFN tariff for three years. Any invocation of these "snapback provisions" could reduce the export gains American furniture manufacturers have enjoyed since the FTA's implementation.

As a means of adjusting to altered trading patterns, several Canadian household furniture manufacturers, established or bought existing plants in the United States in recent years. While they hope to achieve greater manufacturing and marketing efficiencies in the present, these firms are also positioning themselves for a future free trade area which could encompass the entire North American continent.

Mexico

In late 1990, the Mexican Government requested that the United States enter into free trade negotiations during 1991. After Canada, Mexico is now the largest foreign market for U.S. exports of household furniture, having rebounded rapidly in recent years from their bottom-out level of 1986–87. Exports to Mexico nearly tripled in 1988, then doubled again in 1989. In the first seven months of 1990, U.S. exports continued to increase at a rate of 12 percent over the same period in 1989. Much of this can be attributed to trade reforms instituted by the Mexican Government which dismantled much of the country's intensely protectionist system of trade and tariff barriers.

The evolution of more stringent and costly environmental regulations in the United States has seen corresponding relocations of furniture production facilities from Southern California to border regions in Mexico. The American Furniture Manufacturers Association (AFMA) has claimed that U.S. furniture manufacturers have legally availed themselves of benefits provided under the *maquilladora* program in order to avoid the expenses associated with stricter environmental regulations imposed in the United States—particularly in California. Mexico does offer additional advantages for furniture producers such as proximity (transportation costs are kept to a minimum), lower wage rates in manufacturing, and zero duty as a Generalized System of Preferences (GSP) beneficiary.

The export of wood furniture is an important enterprise among the *maquilladora* plants on or near the U.S. border. In fact, the Mexican Government reported that in 1988, over 150 furniture plants with U.S. owners were operating under the *maquilladora* program. Many of the *maquilladora* plants were established to provide the American market with furniture produced more economically, using cheaper Mexican labor at factories operated under less-costly environmental and safety regulations.

Japan

U.S. exports of household furniture to Japan increased an estimated 25 percent, to $50 million in 1990, retaining for that market its status as the third largest foreign market for American furniture exporters. The healthy growth rate in U.S. household furniture exports to Japan in the late 1980s can be attributed to: 1) changes in currency exchange rates which saw the value of the yen rise in relation to the dollar, making U.S. products far less expensive to Japanese importers; 2) Japanese consumer disposition to products which connote an American lifestyle; 3) U.S. industry and government efforts to achieve real market access in Japan; and 4) persistent marketing on the part of several U.S. exporters who invested the time and money necessary to establish Japanese industry contacts. As a result, U.S. household furniture exports to Japan are expected to continue growing at a healthy rate in the early 1990s, establishing a firm foothold in this important foreign market.

U.S. exports of household furniture to Japan increased an estimated 25 percent to $50 million in 1990.

Japan's Ministry of International Trade and Industry (MITI) inaugurated an import expansion program in April 1990, incorporating: tax incentives to Japanese manufacturers that increase imports; tariff elimination on over 1,000 products (including most household furniture items); low-interest loans to finance imports and foreign direct investment in Japan; and a $100 million grassroots import promotion campaign. The U.S. Department of Commerce expanded its own export promotion program which incorporates government-to-government data and information exchange, market research, the organization of trade promotion events, and renewed trade facilitation services such as business counseling and the provision of market information. As part of this initiative, the Department organized a trade mission, consisting of CEOs from a dozen U.S. furniture manufacturers, which visited Tokyo and Osaka in November 1990 in order to establish furniture industry contacts in Japan. In November 1991, the Department will sponsor a pavilion for American furniture manufacturers at the biennial International Furniture Fair in Tokyo (IFFT), the largest furniture exhibition in Japan.

Outlook for 1991

In constant dollars, domestic shipments of household furniture are expected to decline by 2.1 percent in 1991, about half the rate of decrease estimated for 1990. This forecast is based on the likelihood of continuing softness in residential housing construction. Housing starts are projected to decrease to 1.15 million units in 1991, the fifth year of declining growth in this sector. Other reasons for the expected decline are ongoing macro-economic—tighter market for consumer credit, banking/thrift industry difficulties—and geo-political problems in the Middle East. At the dawn of the new year, these persistent problems—carried over from the previous year—continue to influence consumption patterns of all discretionary purchases like household furniture. However, by mid-1991, domestic consumers in all age brackets who have deferred furniture purchases during the current era of economic uncertainty are expected to begin returning to the market. Renewed consumption is likely to precipitate a slight recovery in product shipments in the latter half of 1991, somewhat improving upon an otherwise negative forecast.

Faced with a less than robust domestic market, household furniture manufacturers will be motivated to put more emphasis on exports in 1991. Currently household furniture exports are in a growth cycle, and are predicted to expand an additional 30 percent in 1991. Nevertheless, the rate of growth in exports will subside to some extent given current economic problems in several of the foreign markets where American furniture exports have grown fastest, i.e., Canada, Japan, and Saudi Arabia.

The rate of growth in household furniture imports is forecast to decline from 7.2 percent recorded in the period 1985-1989, to 1.1 percent in the period 1990-1991. Nonetheless, in absolute terms the value of foreign-produced furniture products on the U.S. market will rise this year and maintain a significant share of domestic consumption.

Long-Term Prospects

While 1991 is expected to be the fourth year of decline in product shipments for the household furniture manufacturing industry, the period 1992-95 should be years of modest industry expansion in the domestic market as well as overseas.

Demographic trends are the principal forces creating optimism for long-term growth. The U.S. Census Bureau's Population Estimates and Projections report suggests that the eldest of the "baby boom" generation (persons born between 1946 and 1965) will move into their peak earning years—from age 45 to 54—during the period. By 1995, the report suggests that over 31 million consumers, or 12 percent of the population (up from 10.2 percent in 1990), will be counted in this age bracket. Persons in their peak earning years often purchase higher quality furniture, frequently replacing items bought earlier in life.

Domestic consumers in all age brackets who have deferred furniture purchases during the current era of economic uncertainty are expected to return to the market early in the cycle, spurring increased furniture expenditures at all price points. With personal income growth predicted to rise as well, the compound annual growth rate for household furniture is forecast in the range of 2.7 to 3 percent from 1992-95.

International trading patterns in the household furniture industry are expected to undergo a transformation throughout this period, particularly if a North American Free Trade Agreement becomes a reality. By the mid-1990s, many former overseas sources may be shipping a completely different mix of products. For example, while Taiwanese furniture exporters are likely to maintain their substantial share of the U.S. market in the foreseeable future, they are apt to begin targeting productive capacity on items which retail at higher prices than in the past. Production of low-end furniture items, recently the staple of Taiwan's furniture shipments, will undoubtedly migrate to alternative supplier nations in the early-to-mid 1990s. These are countries with lower wage rates, less sophisticated production facilities, and large stocks of exploitable raw materials (i.e. China, Malaysia, Indonesia, and the Philippines).

Further, with the advent of a unified Germany in 1990, the ongoing transformation from State controlled to market economies in Eastern Europe and the Soviet Union, and the scheduled 1992 market consolidation within the European Community it is plausible to predict that Italy—America's second largest foreign supplier of furniture in 1990—may find many highly-skilled European contenders competing for shares of the U.S. market within the next five years.

Closer to home, 1991-1995 is going to be a period of transition as well. American furniture manufacturers and exporters will continue to seek new business relationships with Canadian manufacturers, importers, and retailers. The impetus for this action will be the reduction of tariff barriers through 1992, and their elimination in 1993. Moreover, the advent of the Free Trade Agreement with Mexico could stimulate a further realignment of traditional trading patterns within North America, and globally as well. As barriers to foreign investment in Mexico's furniture industry are removed over this period—one aspect of Mexico's more liberalized trade policy—new plants will be built, technology transferred, workers trained, and new businesses established. Eventually, American household furniture importers could justify many sourcing decisions based on Mexico's proximity, its labor force skills, its plentiful stocks of raw materials and inexpensive energy.

U.S. exports of household furniture will continue to grow over the next five years as well, particularly to Canada where the Free Trade Agreement will have eliminated all bilateral tariffs after 1992. Other important markets for U.S. producers and exporters will include Japan, the European Community, and Mexico—where a separate free trade agreement could further reduce, and over time eliminate, all barriers to bilateral commerce. In addition, removal or reductions of foreign trade barriers resulting from the Uruguay Round GATT Negotiations (which were scheduled to conclude in December 1990) would provide additional export opportunities to other trading partners:—*Joe Enright, Automotive Affairs & Consumer Goods, (202) 377-3459, October 1990.*

HOUSEHOLD APPLIANCES

Product shipments of household appliances were $16.9 billion in 1990. Shipments were down 2.5 percent from 1989 in constant dollars. Although 1990 shipments were ahead of those for 1989 for most of the year, beginning in the Fall, there was a marked slowdown in shipments, more than offsetting the earlier gains.

The slowdown in shipments resulted primarily as consumer confidence fell and unemployment and inflation rose late in

Trends and Forecasts: Household Appliances (SIC 363)

(in millions of dollars except as noted)

Item	1987	1988[1]	1989[2]	1990[2]	1991[3]	Percent Change 1987-88	1988-89	1989-90	1990-91
Industry Data									
Value of shipments[4]	16,498	17,356	18,250	18,156	—	5.2	5.2	−0.5	–
3631 Household cooking equip	3,396	3,658	3,690	3,448	—	7.7	0.9	−6.6	–
3632 Household refrigerators	3,519	3,758	3,988	4,051	—	6.8	6.1	1.6	–
3633 Household laundry equip	3,035	3,163	3,265	3,369	—	4.2	3.2	3.2	–
3634 Elect housewares & fans	2,826	2,814	3,088	3,031	—	−0.4	9.7	−1.8	–
3635 Household vacuums	1,324	1,598	1,694	1,685	—	20.7	6.0	−0.5	–
3639 Home appliances nec	2,398	2,364	2,525	2,572	—	−1.4	6.8	1.9	–
Value of shipments (1987$)	16,498	17,245	17,843	17,395	16,668	4.5	3.5	−2.5	−4.2
3631 Household cooking equip	3,396	3,709	3,780	3,522	3,310	9.2	1.9	−6.8	−6.0
3632 Household refrigerators	3,519	3,744	3,850	3,877	3,760	6.4	2.8	0.7	−3.0
3633 Household laundry equip	3,035	3,154	3,225	3,199	3,071	3.9	2.3	−0.8	−4.0
3634 Elect housewares & fans	2,826	2,761	2,952	2,855	2,712	−2.3	6.9	−3.3	−5.0
3635 Household vacuums	1,324	1,574	1,620	1,555	1,500	18.9	2.0	−4.0	−3.5
3639 Home appliances nec	2,398	2,303	2,416	2,387	2,315	−4.0	4.9	−1.2	−3.0
Total employment (000)	117	119	115	112	110	1.7	−3.4	−2.6	−1.8
3631 Household cooking equip	21.9	21.8	—	—	—	−0.5	—	—	–
3632 Household refrigerators	25.7	26.9	25.5	—	—	4.7	−5.2	—	–
3633 Household laundry equip	16.7	17.1	16.9	—	—	2.4	−1.2	—	–
3634 Elect housewares & fans	25.2	24.9	24.8	—	—	−1.2	−0.4	—	–
3635 Household vacuums	11.3	12.7	—	—	—	12.4	—	—	–
3639 Home appliances nec	16.0	15.5	—	—	—	−3.1	—	—	–
Production workers (000)	92.6	94.7	91.9	89.4	87.0	2.3	−3.0	−2.7	−2.7
3631 Household cooking equip	16.9	17.3	—	—	—	2.4	—	—	–
3632 Household refrigerators	21.6	22.5	21.4	—	—	4.2	−4.9	—	–
3633 Household laundry equip	14.1	14.5	14.3	—	—	2.8	−1.4	—	–
3634 Elect housewares & fans	19.3	19.2	19.2	—	—	−0.5	0.0	—	–
3635 Household vacuums	7.6	8.6	—	—	—	13.2	—	—	–
3639 Home appliances nec	13.1	12.6	—	—	—	−3.8	—	—	–
Average hourly earnings ($)	10.75	10.82	10.89	10.87	—	0.7	0.6	−0.2	–
3631 Household cooking equip	9.72	9.65	—	—	—	−0.7	—	—	–
3632 Household refrigerators	12.49	12.77	—	—	—	2.2	—	—	–
3633 Household laundry equip	13.48	13.18	—	—	—	−2.2	—	—	–
3634 Elect housewares & fans	7.58	7.56	—	—	—	−0.3	—	—	–
3635 Household vacuums	11.30	10.63	—	—	—	−5.9	—	—	–
3639 Home appliances nec	10.63	11.27	—	—	—	6.0	—	—	–
Capital expenditures	430	579	—	—	—	[illegible]	—	—	–
3631 Household cooking equip	79.6	130	—	—	—	63.[illegible]	—	—	–
3632 Household refrigerators	100	164	—	—	—	64.0	—	—	–
3633 Household laundry equip	73.4	110	—	—	—	49.9	—	—	–
3634 Elect housewares & fans	57.0	37.9	—	—	—	−33.5	—	—	–
3635 Household vacuums	59.6	58.0	—	—	—	−2.7	—	—	–
3639 Home appliances nec	60.2	79.3	—	—	—	31.7	—	—	–
Product Data									
Value of shipments[5]	15,509	16,135	16,980	16,944	—	4.0	5.2	−0.2	–
3631 Household cooking equip	3,233	3,267	3,296	3,079	—	1.1	0.9	−6.6	–
3632 Household refrigerators	3,322	3,532	3,748	3,806	—	6.3	6.1	1.5	–
3633 Household laundry equip	2,791	2,876	2,968	3,063	—	3.0	3.2	3.2	–
3634 Elect housewares & fans	2,589	2,628	2,884	2,845	—	1.5	9.7	−1.4	–
3635 Household vacuums	1,291	1,519	1,612	1,598	—	17.7	6.1	−0.9	–
3639 Home appliances nec	2,285	2,314	2,472	2,553	—	1.3	6.8	3.3	–
Value of shipments (1987$)	15,510	16,065	16,633	16,221	15,550	3.6	3.5	−2.5	−4.1
3631 Household cooking equip	3,233	3,341	3,376	3,145	2,955	3.3	1.0	−6.8	−6.0
3632 Household refrigerators	3,322	3,513	3,618	3,643	3,535	5.7	3.0	0.7	−3.0
3633 Household laundry equip	2,791	2,878	2,932	2,909	2,790	3.1	1.9	−0.8	−4.1
3634 Elect housewares & fans	2,589	2,585	2,770	2,680	2,545	−0.2	7.2	−3.2	−5.0
3635 Household vacuums	1,291	1,494	1,540	1,475	1,425	15.7	3.1	−4.2	−3.4
3639 Home appliances nec	2,285	2,254	2,397	2,369	2,300	−1.4	6.3	−1.2	−2.9

[1] Advance data from the 1988 Annual Survey of Manufactures.

[2] Estimate.

[3] Forecast.

[4] Value of all products and services sold by establishments in the household appliances industry.

[5] Value of products classified in the household appliances industry produced by all industries.

SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA). Estimates and forecasts by ITA.

1990. Also, the increasingly bleak housing market in many parts of the country further slowed shipments. Housing starts and resales were at or near the low levels last seen in 1982. Other negative factors for appliance shipments included a high consumer debt to disposable income ratio, and a rising savings rate.

Percentage changes in shipments of the various appliance categories tended to be quite similar, with the exception of microwave ovens. Estimated shipments of microwave ovens declined nearly 30 percent during 1990 to 2.7 million units as domestic consumption fell approximately 25 percent to 8.0 million units. During the mid-to-late 1980s, microwave oven consumption had ranged from 10.6 to 12.6 million units annually. The sharp fall-off is attributed to market saturation with the ovens now believed to be in over 80 percent of all U.S. homes. Today, most sales are for replacement or to multiple unit households. More knowledgeable buyers are interested in ovens that are easy to use, rather than those having several power levels and functions, most of which are never used. The substantial decline in demand and the trend toward more basic models, a large percentage of which are imported, has resulted in increased pressure on manufacturers to lower prices.

During 1990, producer prices for household appliances increased moderately, essentially the same rate as producer prices for household durables. Between January and August —the latest month for which price data were available—producer prices for household appliances rose 2.4 percent on an annual basis; producer prices for household durables rose 2.2 percent. During the 1980s, producer prices for household appliances and household durables increased 2.8 percent and 2.9 percent, respectively. The only appliance categories whose price changes during 1990 differed substantially were refrigerators and portable microwave ovens. Producer prices for refrigerators rose at a 0.8 percent annual rate during the first eight months while those for microwave ovens fell at a 5.6 percent annual rate. These changes reflect price competition resulting from the opening of a new efficient refrigerator plant and from sharply lower demand for microwave ovens. During the 1980s, refrigerator prices increased 2.9 percent annually, about the same as the appliance industry in general. During the same period, microwave oven prices declined 4.1 percent annually as microwave oven production volume and production efficiency increased rapidly.

Energy Efficiency Standards

In late 1989, the Department of Energy (DOE), pursuant to the National Appliance Energy Conservation Act, revised its energy efficiency standards for refrigerators. The new standards, which become effective in 1993, will reduce refrigerator electrical consumption by more than 25 percent. In fact, under the new standards, a typical refrigerator will consume less electricity than a 100 watt bulb.

The new standards are considered stringent by the industry but reflect those already in effect in California which had the nation's toughest standards. California accounts for over 10 percent of domestic refrigerator sales. The standards are expected to be met by improving the efficiency of refrigerator heat-evacuation and insulation systems. No redesign of exteriors is likely to be necessary. While the new standards will cause the price of a typical refrigerator to increase by about 10.5 percent to $559, they will result in lower life-cycle costs due to greater savings in operating expenses. DOE is expected to review appliance energy efficiency standards again in 1994.

Chlorofluorocarbon Restrictions

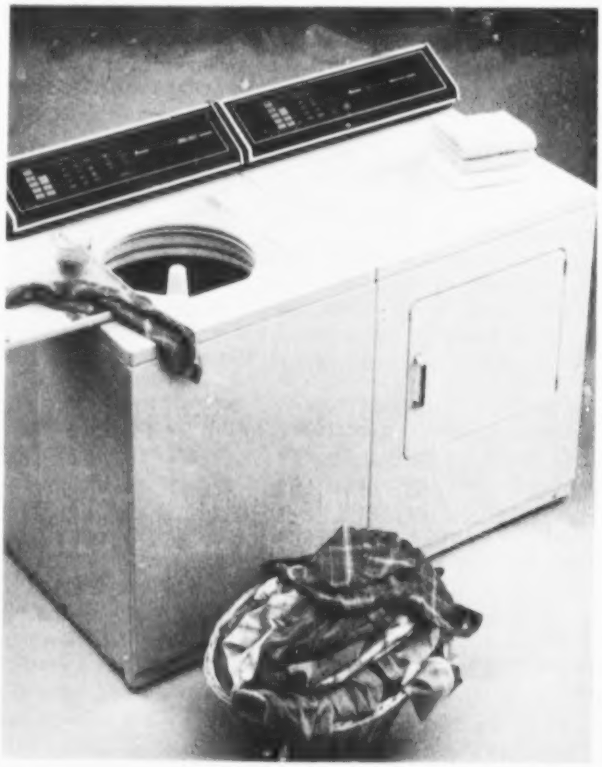
Chlorofluorocarbons (CFCs) are important chemicals in the manufacture and operation of many products including refrigerators where they are used in the coolant and in the foam insulation. In recent years, CFCs have been blamed for depleting the ozone layer in the stratosphere. Ozone blocks out harmful ultraviolet rays from the sun, which can cause skin cancer.

In 1987, the United States became a signatory to the Montreal Protocol, a treaty aimed at capping CFC production at the 1986 level beginning in 1989 and gradually reducing it to 50 percent of the 1986 level by 1998. In June 1990, the Montreal Protocol was amended to accelerate the scheduled reductions and to provide for the complete elimination of CFC production by the year 2000. The Protocol allows certain developing countries using low per capita CFC amounts a ten-year delay in the reduction schedule. These changes were automatically binding for all parties to the Protocol six months after it was amended.

Therefore, the appliance industry must find a safe, reliable alternative soon. The Appliance Industry-Government CFC Replacement Consortium, a technical partnership of the refrigerator-freezer industry and various government agencies, was formed to identify and test alternatives. Some substitutes have been proposed but they appear to be less energy efficient than CFCs and they have not all been fully tested. Also, none are yet available in commercial quantity. However, one of these substitutes, HFC-134a, is expected to be available by mid-decade. This refrigerant, besides being less energy efficient, would require refrigerators to be modified since it is not compatible with existing systems. A less efficient substitute will make it more difficult for the industry to meet energy efficiency standards specified for refrigerators by the National Appliance Energy Conservation Act.

INTERNATIONAL COMPETITIVENESS

The balance of trade in appliances continues to benefit from the current relatively low value of the U.S. dollar on foreign exchange markets compared to its value during the mid-1980s. In 1990, imports fell 6 percent to $2.6 billion while exports rose 14 percent to $1.8 billion. Since 1986, when appliance imports exceeded exports by about 3 to 1,



Amana, Inc.

U.S. exports of clothes washers and dryers and other household appliances have nearly doubled since 1986.

exports have surged, approximately doubling, while imports have increased less than 15 percent. Today, imports exceed exports by less than 50 percent.

The leading foreign suppliers of appliances to the United States are Japan, China, South Korea and Mexico. While Japan and South Korea have been major suppliers for a number of years, China and Mexico only recently have entered the top ranks. Both of these countries have opened their economies to foreign trade in recent years. In addition, China has an advantage of very low labor rates while Mexico has advantages of low labor rates and geographical proximity to the United States. Pushed out of the top four supplier ranks were Hong Kong and Taiwan. These suppliers, as well as South Korea and Singapore, have lost market share due to soaring labor rates and the loss of duty-free treatment because of graduation from the Generalized System of Preferences beginning in 1989.

The leading U.S. export markets are Canada, Mexico, Taiwan and Japan. Exports to all of these markets have benefited from the lowering of tariffs in those countries in recent years. Exports to Canada are expected to continue to increase as its economy becomes more integrated with that of the United States due to the scheduled elimination of tariff rates under the U.S./Canada Free Trade Agreement. Similar benefits would accrue under the proposed U.S./Mexico Free Trade Agreement.

Outlook for 1991

The same factors that slowed appliance shipments in late 1990 also will slow 1991 shipments. These factors include depressed consumer confidence and declining housing sales, as well as increased unemployment, inflation, and savings rates. Constant dollar product shipments of appliances are expected to decline 4.1 percent in 1991.

Long-Term Prospects

Product shipments of appliances are expected to increase at a real compound annual rate of 1 percent during the next 5 years. The appliance industry is a mature industry with replacements accounting for most shipments. New housing, which historically has accounted for approximately 20 to 25 percent of shipments, is expected to account for a smaller share in the 1990s due to fewer future housing starts. In addition, the products are mature, showing little difference from one manufacturer to another. Nor are there any radically new products to stimulate sales. The latest innovative product to become widely accepted is the microwave oven.

With no new major products and little product differentiation among the various manufacturers' appliances, sales promotion increasingly tends to emphasize price or quality. Lower prices will put pressure on industry profits while increased quality could result in replacement sales occurring less frequently in the future. In addition, refrigerator sales will suffer to the extent that CFC replacement results in higher costs to consumers.

A positive factor is the continued expansion of the number of women in the workforce. Their number is expected to increase from 56.7 million in 1990 to 61.7 million in 1995, while the participation rate of women in the workforce is expected to grow from 57.6 percent to 60.1 percent. While this growth will increase demand for labor saving appliances, it will be less important than the expansion recorded over the past 20 years when slightly greater numbers of women were annually entering the workforce. During that period, 1970-1990, the number of women in the workforce increased 3.0 percent annually compared to an expected annual increase of 1.7 percent between 1990 and 1995:—*John M. Harris, Office of Consumer Goods, (202) 377-1178, October 1990.*

LAWN AND GARDEN EQUIPMENT

The lawn and garden equipment industry, SIC 3524, consists of lawn mowers, rotary tillers, powered edge trimmers, shredders, snow and leaf blowers, and garden tractors. This category does not include garden hand tools, like shovels, rakes, and shears or commercial turf maintenance equipment.

In 1990, constant-dollar product shipments of lawn and garden equipment increased by an estimated 1 percent. An estimated 14 percent growth in exports was one of the main reasons for the increase in product shipments. Meanwhile, the domestic market experienced little growth. U.S. manufacturers' product shipments to the domestic market declined fractionally. However, imports were up an estimated 26 percent in 1990 after a 59 percent decline in 1989.

Three major indicators of the industry's health are new housing starts, personal disposable income, and regional precipitation. Declines in new housing starts and the slower growth in real personal disposable income signaled sluggish

Trends and Forecasts: Lawn and Garden Equipment (SIC 3524)

(in millions of dollars except as noted)

Item	1987	1988[1]	1989[2]	1990[2]	1991[3]	Percent Change 1987–88	1988–89	1989–90	1990-91
Industry Data									
Value of shipments[4]	4,594	4,828	4,929	5,085	—	5.1	2.1	3.2	—
Value of shipments (1987$)	4,594	4,712	4,594	4,635	4,590	2.6	−2.5	0.9	−1.0
Total employment (000)	24.9	26.1	25.0	25.1	—	4.8	−4.2	0.4	—
Production workers (000)	19.1	19.9	19.1	19.3	—	4.2	−4.0	1.0	—
Average hourly earnings ($)	9.69	9.57	9.60	9.60	—	−1.2	0.3	0.0	—
Capital expenditures	111	97.4	—	—	—	−12.3	—	—	—
Product Data									
Value of shipments[5]	4,061	4,175	4,267	4,402	—	2.8	2.2	3.2	—
Value of shipments (1987$)	4,061	4,093	3,999	4,035	3,993	0.8	−2.3	0.9	−1.0

[1] Advance data from the 1988 Annual Survey of Manufactures.

[2] Estimate.

[3] Forecast.

[4] Value of all products and services sold by establishments in the lawn and garden equipment industry.

[5] Value of products classified in the lawn and garden equipment industry produced by all industries.

SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA). Estimates and forecasts by ITA.

demand for lawn care products in 1989 and 1990. However, in 1990, wet weather in most of the United States helped boost sales. The *Weekly Weather and Crop Bulletin*, published by the National Oceanic and Atmospheric Administration, reported that 60 percent of selected U.S. cities experienced above normal rainfall and only 11 percent experienced rainfall below 75 percent of the norm through mid-September.

The market for lawn care products has traditionally relied upon sales of walk-behind mowers. In recent years, however, U.S. producers have experienced increased sales of riding mowers, especially front engine riding mowers. In 1990, riding-type mowers accounted for 56 percent of the total value of all lawn mowers compared to 53 percent in 1988. "Step-up" housing sales have been one of the driving forces behind the growth of riding mowers. However, demand for riding mowers in a particular year is also strongly related to new housing growth of the previous year. Therefore, four years of decreases in new housing starts, with predictions of another decrease in 1991, have caused some concern in the industry.

INTERNATIONAL COMPETITIVENESS

The good news in trade was an estimated $26 million increase in the U.S. trade surplus in lawn and garden equipment in 1990 as U.S. exports continued to rise. Exports of lawn and garden equipment rose 14 percent to an estimated $474 million in 1990, while imports rose by about 26 percent to $140 million. The reported growth of U.S. exports between 1989 and 1990 may be misleading because the U.S. Census Bureau changed the basis for reporting U.S. exports in 1990. Official Canadian import data, which appears to have better reporting rates, was subsituted for U.S. export declarations in U.S. trade data. When computing Canadian imports from the United States for 1989 and 1990, the growth rates are lower.

U.S. lawn and garden equipment exports grew in 1990 as the U.S. dollar's value remained low vis-a-vis major currencies. The European Community (EC) is the largest market for lawn and garden equipment. The 12 EC countries, as a whole, received about 40 percent of U.S. exports in 1990. However, the largest single country market is Canada. U.S. exports to Canada totaled an estimated $143 million in 1990. Lower tariffs, as a result of the U.S.-Canada Free Trade Agreement, have help U.S. manufactured products to be more cost competitive. Original Canadian tariffs on lawn and garden equipment were 9.2 and 10.2 percent but will be eliminated in annual staged reductions by 1998.

In 1989, firms from Japan and Canada increased production at their U.S. facilities as imports fell 59 percent. In 1990, imports from Japan increased an estimated 43 percent as a result of a 74 percent increase in lawn mower parts. However, imports from Canada grew only an estimated 1 percent in 1990. Japan and Canada combined accounted for an estimated 86 percent of U.S. lawn and garden equipment imports.

Outlook for 1991

The constant-dollar product shipments of lawn and garden equipment is forecast to decline 1 percent in 1991. As the unit price of smaller lawn mowers continues to fall, producers and retailers will attempt to restore profit margins by emphasizing the convenience of front engine riding mowers. The trade situation is expected to improve as the dollar remains relatively low vis a vis major currencies and foriegn multinational companies increase production at U.S. facilities. Exports of lawn and garden equipment are forecast to grow 13 percent in 1991. Firms that have devoted time and resources to building overseas markets also should continue to benefit, especially targeted temperate climate countries and in those with opposite seasons to the United States, as in the case of Australia. In addition, imports likely will fall slightly.

Exports of lawn and garden equipment, like this snow blower, were forecast to grow 13 percent in 1991.

Long-Term Prospects

The long-term growth prospects for lawn and garden equipment are good, with an expected annual increase of 2 percent in constant-dollars over the next 5 years. Demographic changes in the domestic market will favor the industry as more consumers have greater amounts of discretionary income. The 35–49 age group, the fastest growing age group from 1990 to 1995, will be reaching their maximum wage earning period which should boost sales of lawn equipment. Many of these consumers will be trading up for larger houses with larger lawn areas or will invest more income in upgrading their current dwellings including their homes' landscape. Although weather conditions will always have a profound effect on regional sales of lawn and garden machinery, the industry has expanded enough, both nationally and internationally, to smooth out climate-related peaks and valleys. International trade in lawn and garden equipment is expected to continue to increase. The removal of trade barriers between the United States and Canada will provide additional opportunities for companies on both sides of the border. Additionally, the potential introduction of unified EC standards for lawn mowers and other garden machinery could facilitate the sales of U.S. products in that market:—*John A. Vanderwolf, Office of Consumer Goods, (202) 377-0348, October 1990.*

CONSUMER ELECTRONICS

U.S. shipments of household consumer electronics products increased marginally at 3 percent during 1990 to reach $7 billion on a constant dollar basis. This slower growth was due to slack replacement purchases and fewer second-set buyers for television and a somewhat smaller pool of customers for such youth-oriented products as boom boxes and high-end autosound products such as car stereos, AM/FM radios, compact disc/cassette players, and car digital audio tape players.

Shipments of the principal products in the consumer electronics industry had mixed performance. Color television and videocassette recorder (VCR) sales declined, while projection television and camcorder sales had their best year yet. In 1990, color television and VCRs, the mature sectors characterized by continuous and significant price declines over the past decade, appear to be near the saturation point. Laser discs—while still a small part of the video market—nevertheless, are receiving increased attention. The laser video player is one of the fastest growing consumer electronic products in both Japan and the United States. Laser disc recorders have the high-quality sound of compact discs with sharp clear pictures, but unlike VCRs cannot record. In the audio industry, compact disc players (CD) and loud-speakers (high-end) faired particularly well.

The movement of foreign-owned manufacturing facilities to the United States continues to abate. A growing number of new plants are being located in Mexico, in order to take advantage of the Mexican government's *maquiladora* programs. The United States is left in the position of being a manufacturer or assembler of niche products, such as high-end television sets and loudspeakers. VCRs, CDs, laser discs players, and camcorders, are still largely the products of companies in Japan and South Korea; due to the virtual nonexistence of the main components for these products in the United States.

Industry Developments

High-definition television (HDTV), considered by many to be the next major achievement in video technology, is now being developed in Japan and Europe. This technology is expected to provide the picture quality of a 35 millimeter photograph and the sound quality of the compact discs player. The United States is in the process of establishing an HDTV standard, hopefully by 1993. The Japanese, who pioneered its development, are presently in the lead with regular broadcasts. The Olympic Games in Seoul, Korea were the first big event to be televised in HDTV. The broadcast standard now used by the Japanese is not compatible with European standards and will not be compatible with the U.S. standard when it is selected. It must be pointed out that because of the lead the Japanese have in this technology, they will be able to develop and produce equipment compatible with any standard the U.S. chooses.

The Advanced Television Advisory Committee of the Federal Communications Commission (FCC) is now examining proposals for a U.S. HDTV transmission system. The broadcast signal must be compatible with existing sets so that current set owners will continue to receive programming without an adaptor. The testing should be completed by mid 1992 and the FCC is expected to announce its decision on a simulcast standard some time in the spring of 1993.

Zenith Corporation, with about 13 percent of the U.S. color set market, is the only U.S.-owned producer of television sets in the United States. The company was among a group of six U.S companies to receive a contract for work on high-resolution video displays from the Defense Advance Research Projects Agency, (DARPA). The contract is the first from DARPA to go to a consumer electronics manufacturer. The Defense Department is providing funds for research on display-related technology needed by the military.

Zenith will use the funding for work on a big-screen versions of the highly successful 14 inch improved-resolution flat tension mask (FTM) tube, which is now marketed for use in computer monitors. Contracts also went to Tektronix for work on its TekVision flat-panel plasma display, Norden Systems for a flat electroluminescent display, and Microelectronics & Computer Technology for a field emission display.

Television Market

In 1990, for the first time in a decade, color television sales failed to set a record—reaching only 21.1 million sets, down 2.3 percent from last year's record level, according to Electronic Industries Association. Conversely, sales of projection TVs increased to 300,000 units, up 8.8 percent over last year. Projection sets and direct-view screens, 30

Trends and Forecasts: Household Audio and Video Equipment (SIC 3651)

(in millions of dollars except as noted)

Item	1987	1988[1]	1989[2]	1990[2]	1991[3]	Percent Change 1987–88	1988–89	1989–90	1990–91
Industry Data									
Value of shipments[4]	5,911	6,376	6,567	6,764	6,967	7.9	3.0	3.0	3.0
Value of shipments (1987$)	5,911	6,538	6,798	7,002	7,212	10.6	4.0	3.0	3.0
Total employment (000)	30.9	31.8	353	350	—	2.9	1010.1	−0.8	—
Production workers (000)	23.6	24.2	27.5	26.8	—	2.5	13.6	−2.5	—
Average hourly earnings ($)	8.02	8.39	8.72	9.00	—	4.6	3.9	3.2	—
Capital expenditures	125	128	—	—	—	2.4	—	—	—
Product Data									
Value of shipments[5]	5,925	6,166	6,350	6,540	6,736	4.1	3.0	3.0	3.0
Value of shipments (1987$)	5,925	6,286	6,480	6,673	6,873	6.1	3.1	3.0	3.0

[1] Advance data from the 1988 Annual Survey of Manufactures.

[2] Estimate.

[3] Forecast.

[4] Value of all products and services sold by establishments in the household audio and video equipment industry.

[5] Value of products classified in the household audio and video equipment industry produced by all industries.

SOURCE: U.S. Department of Commerce: Bureau of the Census: International Trade Administration (ITA). Estimates and forecasts by ITA.

inches or more accounted for just over 2 percent of the overall television market in 1990. The trend towards larger TVs continues while upgraded sets with such improvements as remote control, stereophonic sound, and improved resolution tubes that provide sharper, more detailed pictures are also popular.

Monochrome television (black and white) sales amounted to 1.5 million sets in 1990, the lowest since the early days of TV in the 1950s. The combination of a sluggish economy and household ownership of television sets at 98 percent resulted in 1990 total sales of 22.9 million sets, down 4.2 percent from the 1989 level.

Asian liquid-crystal display (LCD) manufacturers were not allowed to have LCD receivers exempted from U.S. antidumping penalties against color TVs. In a preliminary ruling, the Department of Commerce rejected a petition from Japanese LCD manufacturers requesting that handheld portable LCD televisions with screen six inches or smaller be excluded from antidumping duties. The petition was filed under the 1988 Trade Act which allows for reconsideration of merchandise that did not exist at the time of the original dumping case. The petition was rejected on the grounds that LCD sets were not distinguishable from other Japanese color televisions covered in previous anti-dumping cases.

In 1989, Zenith, the sole remaining U.S.-owned television producer, became the first company in the country that successfully petitioned the Department of Commerce to monitor a select group of TV imports from Mexico and Malaysia. Zenith charged that Asian television manufacturers were shifting production away from headquarter countries to avoid antidumping penalties and requested that television imports from sever countries in that region and Mexico be monitored for possible injurious dumping.

The Department can begin a full-scale antidumping investigation of the countries involved, if it concludes through its monitoring program that dumping activities are taking place. The Department agreed to monitor imports from Mexico and Malaysia for up to one year and found insufficient evidence to warrant an investigation.

In another petition, the Committee to Preserve American Color Television (COMPACT) asked the Department of Commerce to impose antidumping duties to stop color picture tubes from entering the United States inside television sets made in Mexico. COMPACT charged that certain foreign manufacturers from Korea, Singapore, and Canada are circumventing the anti-dumping duty order by shipping picture tubes to Mexico for assembly into sets and importing the finished TV to the United States. In the petition, COMPACT proposed that the Department use Section 781 of the Trade Act to bring televisions from Mexico within the scope of the antidumping duty orders on color picture tubes. The Department has initiated the investigation.

Videocassette Recorder Market

After peaking at 13 million units in 1987, the videocassette recorder (VCR) market remained flat over 1989 and 1990. Sales figures suggest VCRs have reached the saturation point and replacement purchases and upgrading are driving the market. About 70 percent of all U.S. television households contain a VCR. Most VCRs now in use conform to either the Beta or VHS format, and use half-inch tape in easy-to-load cassettes. Domestic production of VCRs accounts for less than 10 percent of total U.S. consumption.

Go-Video Inc. is the first U.S company to design and market a VCR, challeging the Japanese dominance over the market. Household penetration of camcorders has reached 10 percent primarily from owner's of home VCRs. Nearly all camcorders are imported from Japan. In 1990, camcorders reached record sales of 2.6 million units an increase of 19.2 percent over last year's level and outpaced all other video equipments sales, according to the Electronics Industries Association.

Camcorders are available in all formats—full-sized VHS and Beta as well as the compact VHS-C and 8MM models, all of which can be played back on a television set using an appropriate VCR. Industry sources estimate in 1990, that VHS-C and the 8MM are currently neck and neck with each holding around 25 percent of the market, leaving full-sized with 50 percent or less.

Audio Market

The audio market offers significant potential growth as new technologies such as compact disc (CD) and digital audio tape are transforming home entertainment in America. Sale of CD players continue to rise while supporting upgrade markets in related components, such as amplifiers, receivers, and loudspeakers. During 1990, household-type speakers continued to ride the crest of compact discs player popularity as did the autosound market. After sales car audio equipment, a segment of the autosound market is being hailed, by some industry officials, as one of consumer electronics growth products and it is expected to grow nearly 7 percent in 1990.

Domestic automotive loudspeaker producers, who now include several foreign-owned participants, benefit from being able to sell directly to auto makers and to the aftermarket. Sales of automotive loudspeakers have risen as the size and number of speakers in each vehicle increases. Domestic production of autosound reproduction equipment, such as radios and tape players, is almost entirely linked to the level of passenger vehicles manufactured for the U.S. market each year.

While digital recording technology originated mainly in the United States through developments in the computer industry, no domestic firms have produced a digital recorder for consumer application. U.S. companies are not likely to participate in the manufacturing of CD players or DAT machines due to the lack of internal components. DAT sales in the United States are not predicted to rise in 1990, especially without a clear signal, dealing with the resolution of copyright infringements. Japanese companies are shipping DAT systems and tapes to the U.S. consumer market, although, legislation protecting copyrights has not yet passed. Music writers and publishers have filed a class action suit in the federal court to stop Sony from selling DAT systems and cassettes. The suit cites Sony as inaugurating a new era in unauthorized home taping of copyrighted musical composition.

Legislative Initiatives

In 1990, Congress introduced several pieces of technology legislation such as the Advance Television Standards Act, the Television Decoder Circuitry Act and the Digital

Audio Tape Recorder Act, which will have a major impact on consumer electronics: The Advanced Television Standards Act of 1990 would require the Federal Communication Commission (FCC) to promote U.S.—based research, development and manufacturing of high definition television and other advanced TV standards. The bill would authorize $2.2 million to be added to the FCC's fiscal 1990 budget, and another $2.45 million in fiscal 1991 to allow the FCC to complete its testing of proposed terrestrial HDTV broadcast systems. The bill would also require the Commerce Department's National Telecommunications and Information Administration to submit recommendations to Congress on international standards.

The Television Decoder Circuitry Act of 1990 would require that all new TV sets of 13 inches or more be equipped, by October 1, 1992 with circuitry that will allow display of closed-captioned transmissions for the hearing-impaired. The bill, if passed, will aide millions of deaf and hard-of-hearing people to have full access to television.

The Digital Audio Tape (DAT) bill mandates inclusion of the Serial Copy Management System (SCMS) in all consumer DAT recorders marketed in the United States. The system allows DAT machines to make unlimited direct-digital, first-generation copies from a digital source, but prevents digital copying from copies. DAT hardware manufacturers and the international recording industry disagree over the use of the SCMS technology.

INTERNATIONAL COMPETITIVENESS

U.S. exports of consumer electronics rose in 1990 to a record level of about $1.8 billion, while imports of those products fell about 4 percent to $13.1 billion, narrowing the consumer electronic deficit to $11.3 billion. Canada and Mexico were the largest foreign markets for U.S. consumer electronic goods, and together accounted for about 40 percent of the total value of exports. Major suppliers to the U.S. market were Japan, the prominent leader, followed by West Germany, together accounting for over 60 percent of the consumer electronics imported in 1990.

Japan's share of U.S. consumer electronic imports to the United States reached a high of $9.3 billion in 1986 then fell to $4.6 billion in 1990. Production in Japanese-owned U.S., Mexican, and Pacific Rim facilities accounted for the decline. U.S., Korean, and Japanese companies have come to rely heavily on their plants located near the northern borders of Mexico, and the growth of these operations is expected to rise further in 1990.

Foreign companies operating in Mexico produce almost exclusively for the U.S. market, so trade figures in consumer electronics between the two countries are principally an extension of shipments between the United States and Asia. Color television imports to the United States dropped 24 percent from 12.5 million units in 1989 to 9.5 million units in 1990. The import decline reflects the significant effect on the ratio of imports to domestic manufacture by sourcing decisions made by foreign-owned firms.

Mexico is the leading supplier, followed by Malaysia, while Japan has dropped to sixth place. These movements are indicative of the production shifts from The Pacific Rim to Mexico. Monochrome television imports, down 26 percent, continued their precipitant decline. Korea and Taiwan were the leading suppliers in this category with 39 and 24 percent respectively. Japan supplied only 5 percent of all units shipped to the United States in 1990. Imports of VCRs plummeted 65 percent in 1990, to their lowest level, reflecting the saturation of a mature industry.

Japan continues to dominate in terms of units shipped, although that country's share to the U.S. market dropped from 70 percent in 1988 to about 40 percent in 1990. Singapore supplied 37 percent of all VCRs shipped to the United State in 1990, reflecting the shift in manufacturing locations due to the high-cost of production in Japan. Japanese companies continued to dominate the CD player market supplying over 5 million units in 1990 representing over 80 percent of all units shipped to the US. market.

Outlook for 1991

Demand for consumer electronic products will continue to be sluggish and only moderate growth is expected in 1991. Although decisions of foreign-owned companies to manufacture at their plants in the United States, in Mexico, or in Asia will influence domestic production figures. The constant dollar value of U.S. product shipments is expected to increase about 3 percent in 1991. Technological improvements in consumer electronic products will continue to drive consumers' purchases, although the manufacturers' attempts to raise retail prices may surpress demand. Imports are expected to decease slightly, while exports continue to increase. Japanese suppliers will dominate sales, but a growing number of products will come from Taiwan, Mexico, Hong Kong, and the United States. *Maquilladora* plants will increase demand for U.S. exports of components to Mexico, which will in turn be shipped back to the United States as assembled units.

Long-Term Prospects

Shipments of consumer electronics are expected to increase moderately at an estimated annual rate of 3 percent during 1990 to 1994. For companies located in the United States, the outlook is promising in niche areas such as camcorders, CD players, large-screen televisions, and high-quality loudspeakers. Concomitantly, television, VCRs and autosound equipment could show no growth. These mixed trends cloud the overall picture of consumer electronics, but domestic consumption of audio and video products as a group will grow moderately. Prices for established products are expected to stabilize, while those for new products after introduction will decline. Household audio products will continue to do well as consumers shift from phonograph-based stereo systems to compact discs. Larger and high-quality loudspeakers, as well as amplifiers and other audio components, are expected to be in higher demand. Although autosound equipment demand will reflect U.S. passenger car output, aftermarket purchases for mini-vans and sports vehicles will support sales growth.—*Howard Fleming, Office of Microelectronics and Instrumentation, (202) 377-5163, October 1990.*

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39

Personal Consumer Durables

Shipments of selected personal consumer durables are expected to decline 3.5 percent in 1991 in constant dollars, following a decline of 3.0 percent in 1990. Only shipments of motorcycles and bicycles, boosted by exports, are expected to increase in 1991, as shipments of the jewelry; dolls, toys, games, and children's vehicles; musical instruments; boating; and sporting goods industries fall.

The personal consumer durables industries covered in this chapter are jewelry (SICs 3911 and 3961); musical instruments (SIC 3931); motorcycles, bicycles, and parts (SIC 3751); boat building and repairing (SIC 3732); and sporting and athletic goods (SIC 3949).

Before reading this chapter, please see "How to Get the Most Out of This Book" on page 1. It will clarify questions you may have concerning data collection procedures, factors affecting trade data, forecasting methodology, the use of constant dollars, the differences between industry and product data, sources and reference, and the Standard Industrial Classification system (SIC). For other topics related to the subject of this chapter, see Chapters 6 (Wood Products), 9 (Textile Mill Products), 14 (Plastics and Rubber), 15 (Metals), 17 (Electronic Components and Superconductors), 12 (Entertainment).

Entering 1991, the outlook for the consumer goods industries specified above is unfavorable. Shipments by most of these industries declined in 1990, as did several in 1989. These industries are cyclical, heavily influenced by changes in disposable personal income, personal consumption expenditures, and consumer confidence. Growth in disposable personal income has slowed steadily since 1988, when it increased 4.9 percent in constant dollars over 1987. Growth slowed to 2.4 percent in 1989, and by the second quarter of 1990 had further slowed to only a 0.1 percent change from the preceding quarter, based on seasonably adjusted annual rates.

Similarly, real personal consumption expenditures have dropped since 1988 when they increased 3.6 percent over 1987. Such expenditures increased only 1.9 percent in 1989, and then fell 0.3 percent in the second quarter of 1990 from the preceding quarter. Consumer confidence, as measured by the University of Michigan's Consumer Sentiment Index and the Conference Board's Consumer Confidence Index, dropped to its lowest level since the recession year of 1982.

Partially offsetting these indicators, U.S. exports of personal consumer durables continue to benefit from the sharp decline in the value of the U.S. dollar. From its March 1985 peak through its December 1988 low, the comprehensive world real value of the dollar decreased 29.7 percent, as calculated by the Federal Reserve Bank of Dallas. Since then, the dollar has appreciated only 3.9 percent through July 1990.

In 1990, exports were up an estimated 28 percent, or $800 million, to $3.7 billion, while imports increased an estimated 15 percent, or $2 billion, to $15 billion. Although the percentage growth rate for exports was nearly double that for imports, the higher rate was more than offset by the larger dollar base for imports, resulting in an increased trade deficit. Nevertheless, exports are likely to continue growing at a faster rate than imports while the U.S. dollar remains at or near its 1990 level on foreign exchange markets. The additional shipments expected to result from increased exports are especially welcome, as domestic demand is projected to slacken in 1991.—*John Harris, Office of Consumer Goods, (202) 377-1178, September 1990.*

JEWELRY

Shipments of jewelry, after adjusting for price increases, declined slightly in 1990, reflecting a slowing economy, a

U.S. Exports and Imports
Personal Consumer Durables
(in millions of dollars except as noted)

SIC	Industry	1989	1990[1]	1991[2]	Percent Change 1989-90	Percent Change 1990-91
3732	Boat building and repairing					
	Value of exports	615	814	991	32.4	21.7
	Value of imports	404	270	201	−33.2	−25.6
3751	Motorcycles, bicycles, and parts					
	Value of exports	245	396	447	61.6	12.9
	Value of imports	1,318	1,299	1,277	−1.4	−1.7
3911	Jewelry, precious metal					
	Value of exports	422	455	485	7.8	6.6
	Value of imports	2,591	2,533	2,500	−2.2	−1.3
3931	Musical instruments					
	Value of exports	224	251	263	12.1	4.8
	Value of imports	646	678	746	5.0	10.0
3942	Dolls and stuffed toys					
	Value of exports	54.3	48.0	46.0	−11.0	−4.2
	Value of imports	1,428	1,800	2,200	429	10.0
3944	Games, toys, and children's vehicles					
	Value of exports	331	475	523	43.5	10.0
	Value of imports	4,098	5,800	6,400	46.3	6.7
3949	Sporting and athletic goods, nec					
	Value of exports	942	1,156	1,275	22.7	10.3
	Value of imports	1,828	2,062	2,115	12.8	2.6
3961	Costume jewelry					
	Value of exports	91.2	110	120	20.6	9.1
	Value of imports	510	525	550	2.9	4.8
	Personal Consumer Durables					
	Value of exports	2,925	3,705	4,150	26.7	12.0
	Value of imports	12,823	14,967	15,989	16.7	6.8

[1] Estimate.

[2] Forecast.

SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA). Estimates and forecasts by ITA.

U.S. Trade Patterns in 1989
Personal Consumer Durables
SIC 3732, 375, 3911, 393, 394, 3961
(in millions of dollars, percent)

Exports	Value	Share	Imports	Value	Share
Canada & Mexico	578	19.8	Canada & Mexico	604	4.7
South America	65.6	2.2	South America	173	1.3
European Community	609	20.8	European Community	439	3.4
East Asia NICs	230	7.9	East Asia NICs	6,106	47.6
Japan	677	23.2	Japan	3,029	23.6
Other	766	26.2	Other	2,472	19.3
World Total	2,925	100.0	World Total	12,823	100.0

Top Five Countries

	Value	Share		Value	Share
Japan	677	23.2	Japan	3,029	23.6
Canada	343	11.7	Taiwan	2,155	16.8
United Kingdom	263	9.0	China	1,634	12.7
Mexico	235	8.0	Italy	1,308	10.2
West Germany	156	5.3	South Korea	970	7.6

See "How to Get the Most Out of This Book" for definitions of the Country Groupings.
SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA).

decline in consumer confidence, and rising diamond prices. Shipments of precious metal and costume jewelry were an estimated $5.7 billion, with precious metal jewelry accounting for $4.3 billion and costume jewelry, $1.4 billion. Total constant dollar shipments were down 1.3 percent from 1989, with precious metal jewelry dropping 2.8 percent, and costume jewelry rising 3.5 percent. Consumer demand appeared to shift somewhat from precious metal jewelry to costume jewelry during the year, probably due to rising prices for precious metal jewelry and the desire of consumers to economize because of the uncertain economic outlook.

The jewelry industry is highly cyclical, affected by changes in disposable personal income and consumer confidence. During the first two quarters of 1990, the rate of increase in disposable personal income and personal consumption expenditures slowed, and the University of Michigan's Consumer Sentiment Index declined from 1989 levels. Historically, falling consumer confidence has resulted in a drop in consumer spending on discretionary items such as jewelry.

Since 1987, sales of precious metal jewelry have also been adversely affected by multiple price increases by De Beers, the large diamond sales syndicate. There has been domestic sales resistance to a 10 percent price increase in 1987, a 13.5 percent increase in 1988, a 15.5 percent increase in 1989, and a 5.5 percent increase in 1990. However, robust diamond sales in Japan and other Asian nations helped insure that the price increase would be maintained. In fact, Asian consumers now account for more diamond sales than Americans. Nevertheless, the sharp decline in the Tokyo and several other world stock markets in 1990 will probably postpone price increases in the near future.

Factors Affecting Price

The price of jewelry is not expected to change significantly due to external factors such as supply. For example, the possibility of an embargo on diamonds from South Africa, a major supplier of this important gem, seems remote. A recent General Accounting Office report on the effects of further sanctions against South Africa concluded that banning South African diamonds is not feasible. Since diamonds have no distinguishing characteristics, smuggling and false documentation could easily circumvent such a measure. Furthermore. since diamonds account for only 2 percent of exports from South Africa, a ban would have little effect on its economy. Similarly, while the report suggested that control of the rough diamond market by De Beers could conceivably be broken by a cartel of diamond purchasers, this was considered unlikely by industry analysts, given the advertising, financing, and marketing leadership provided by De Beers.

In 1992 the 12 member countries of the European Community (EC) will create a single market consisting of 325 million people with a Gross Domestic Product of $4.5 trillion and a per capita income of $13,770, as of 1988. Although not expecting the single market to be fully operational until 1992, firms within the EC are already preparing for competition with other world markets.

A major problem limiting U.S. jewelry exports to the EC is the multiplicity of national standards for jewelry among its members, requiring numerous and expensive production and marketing strategies. In 1990, there were ten standards for gold, ranging from 8 to 22 karat, based on the proportion of gold to other metals. Allowable tolerances for gold content vary as well. By contrast, the United States is predominantly a 14-karat market with some 10 karat and 18 karat items also

Trends and Forecasts: Jewelry, Precious Metal (SIC 3911)
(in millions of dollars except as noted)

Item	1987	1988[1]	1989[2]	1990[2]	1991[3]	Percent Change 1987–88	1988–89	1989–90	1990–91
Industry Data									
Value of shipments[4]	4,078	4,339	4,537	4,592	—	6.4	4.6	1.2	—
Value of shipments (1987$)	4,078	4,206	4,350	4,240	4,113	3.1	3.4	−2.5	−3.0
Total employment (000)	35.5	37.3	38.3	37.4	35.5	5.1	2.7	−2.3	−5.1
Production workers (000)	24.8	25.7	26.6	25.6	24.3	3.6	3.5	−3.8	−5.1
Average hourly earnings ($)	7.65	7.52	7.73	8.04	—	−1.7	2.8	4.0	—
Capital expenditures	40.3	27.2	—	—	—	−32.5	—	—	—
Product Data									
Value of shipments[5]	3,858	4,049	4,228	4,283	—	5.0	4.4	1.3	—
Value of shipments (1987$)	3,858	3,925	4,069	3,955	3,836	1.7	3.7	−2.8	−3.0

[1] Advance data from the 1988 Annual Survey of Manufactures.

[2] Estimate.

[3] Forecast.

[4] Value of all products and services sold by establishments in the jewelry, precious metal industry.

[5] Value of products classified in the jewelry, precious metal industry produced by all industries.

SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA). Estimates and forecasts by ITA.

Trends and Forecasts: Costume Jewelry (SIC 3961)

(in millions of dollars except as noted)

Item	1987	1988[1]	1989[2]	1990[2]	1991[3]	Percent Change 1987-88	1988-89	1989-90	1990-91
Industry Data									
Value of shipments[4]	1,392	1,333	1,513	1,612	—	−4.2	13.5	6.5	—
Value of shipments (1987$)	1,392	1,303	1,425	1,475	1,460	−6.4	9.4	3.5	−1.0
Total employment (000)	22.2	23.3	25.5	27.0	26.2	5.0	9.4	5.9	−3.0
Production workers (000)	14.9	15.6	17.4	18.7	17.9	4.7	11.5	7.5	−4.3
Average hourly earnings ($)	6.20	5.95	6.16	6.24	—	−4.0	3.5	1.3	—
Capital expenditures	11.2	13.8	—	—	—	23.2	—	—	—
Product Data									
Value of shipments[5]	1,265	1,196	1,366	1,448	—	−5.5	14.2	6.0	—
Value of shipments (1987$)	1,265	1,169	1,280	1,325	1,312	−7.6	9.5	3.5	−1.0

[1] Advance data from the 1988 Annual Survey of Manufactures.

[2] Estimate.

[3] Forecast.

[4] Value of all products and services sold by establishments in the costume jewelry industry.

[5] Value of products classified in the costume jewelry industry produced by all industries.

SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA). Estimates and forecasts by ITA.

sold. Standards for gold plating thicknesses also differ markedly among the member nations. Compounding the differences are varying systems for testing and certification.

The establishment of EC standards for precious metals, together with the creation of an EC program of testing and certification, will greatly facilitate trade within the EC and with its various trading partners. The EC is now considering a guarantee system for articles containing precious metals based on industry trade convention recommendations. Discussions indicate that the number of allowable standards for gold will be cut sharply, probably to 9, 14, 18, and 22 karat. The present system of independent national hallmarking, testing, and certification may be replaced by compulsory marking of manufacturer or importer fineness, and EC country of entry, as well as random test monitoring. A draft directive is expected in 1991, with a final version to be published in 1992. The new standards will facilitate trade by simplifying production and marketing requirements.

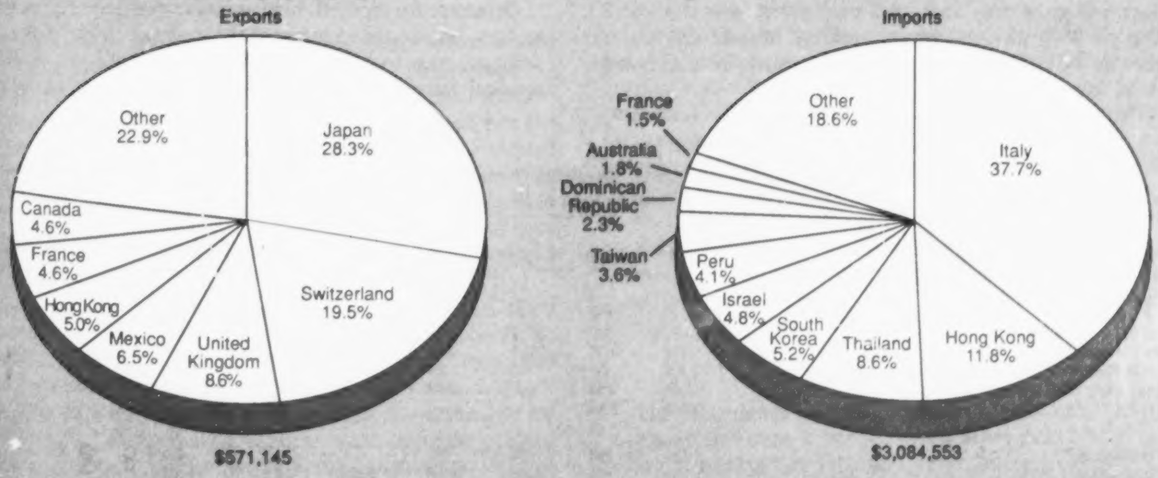
INTERNATIONAL COMPETITIVENESS

Jewelry exports in 1990 continued their strong upward trend of recent years, still benefiting from the substantial drop in the value of the U.S. dollar from its 1985 peak. Precious metal jewelry exports increased to an estimated $455 million (10.5 percent of product shipments), up 8 percent from $422 million in 1989, while costume jewelry exports jumped an estimated 20 percent from $91 to $110 million (7.6 percent of product shipments).

Developed countries are the leading export markets for jewelry. Japan and Switzerland are by far the largest markets

Figure 39-1

Jewelry Exports and Imports by Country, 1990*



* Estimated.

Source: U.S. Department of Commerce, International Trade Administration.

for precious metal jewelry, together accounting for more than half of these U.S. exports. The leading export markets for costume jewelry are Japan, Canada, and the United Kingdom.

U.S. imports of precious metal jewelry decreased an estimated 2 percent to $2.5 billion in 1990. The decline reflected the weakening outlook for domestic jewelry sales. The major suppliers were Italy, Hong Kong, and Thailand. Costume jewelry imports rose an estimated 3 percent to $525 million. The leading suppliers were South Korea and Taiwan.

Outlook for 1991

The constant dollar value of domestic shipments of precious metal jewelry is expected to decline 3 percent during the year, while costume jewelry shipments are expected to fall 1 percent. The decline is related to slowing economic growth and the expected 0.5 percent drop in personal consumption expenditures for durable goods as consumers strive to reduce debt and increase savings. Since jewelry is a highly deferrable expenditure, sales could drop even further, depending on the extent of the economic slowdown.

Long-Term Prospects

While the short-term outlook for the jewelry industry is poor, the long-term prospects are favorable. Between 1990 and 1995, product shipments in constant dollars are projected to increase at a compound rate of 1.5 percent annually for precious metal jewelry and 1.0 percent for costume jewelry. Demographics and foreign trade are the most important factors pointing to such long-term growth.

In the demographic arena, the bulk of the baby boom generation is now middle aged and approaching their highest income years. Their homes have already been purchased, leaving substantial discretionary income. As they age, their disposable incomes will increase even further, fueling purchases of high-quality, luxury products such as jewelry.

In addition, the number of female workers is likely to increase about 1.5 percent annually over the next five years from 56.7 million to 61 million, while the number of male workers will grow only about 0.8 percent per year from 68.3 million to 71.1 million. Since working women are major purchasers of jewelry, they will be responsible for a growing share of future jewelry sales.

Export opportunities should improve if uniform gold standards are adopted by the EC. They will be enhanced by the elimination of a number of tariff restrictions. Under the U.S.-Canada Free Trade Agreement, Canadian tariffs continue to decline, and will be eliminated by 1998. Some developing countries, including Argentina, Brazil, and Venezuela, have begun to reduce import restrictions unilaterally. Finally, the conclusion of negotiations in the Uruguay Round of the General Agreement on Tariffs and Trade (GATT) could reduce or remove other foreign trade barriers.—*John M. Harris, Office of Consumer Goods, (202) 377-1178, September 1990.*

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(Call the Bureau of the Census at 301-763-4100 for information about how to order Census documents.)

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National Jeweler, Gralla Publications, 1515 Broadway, New York, NY 10036. Telephone: (212) 869-1300.

MUSICAL INSTRUMENTS

Shipments of the U.S. musical instruments industry declined in 1990. In constant dollars, shipments fell 5 percent. The value of product shipments for school band and orchestral instruments, as well as for percussion instruments, was stable, while organs and grand pianos declined during this period. However, shipments of fretted instruments grew slightly. Slow growth in real disposable income and uncertainty regarding the economy contributed to the decline in the industry.

Factors Affecting the Industry

Demand for fretted instruments, particularly acoustic guitars, continued to increase throughout 1990. This rise in demand was partially due to the influence on youth of musical television (MTV), which features big name stars

Trends and Forecasts: Musical Instruments (SIC 3931)

(in millions of dollars except as noted)

Item	1987	1988[1]	1989[2]	1990[2]	1991[3]	Percent Change 1987–88	1988–89	1989–90	1990–91
Industry Data									
Value of shipments[4]	814	807	794	786	—	−0.9	−1.6	−1.0	—
Value of shipments (1987$)	814	777	730	694	693	−4.5	−6.0	−4.9	−0.1
Total employment (000)	12.2	11.3	11.3	11.0	—	−7.4	0.0	−2.7	—
Production workers (000)	9.6	8.8	8.7	8.4	—	−8.3	−1.1	−3.4	—
Average hourly earnings ($)	7.89	8.43	8.77	9.03	—	6.8	4.0	3.0	—
Capital expenditures	13.9	23.4	—	—	—	68.3	—	—	—
Product Data									
Value of shipments[5]	781	790	775	767	—	1.2	−1.9	−1.0	—
Value of shipments (1987$)	781	761	700.0	665.0	638	−2.6	−8.0	−5.1	−2.0

[1] Advance data from the 1988 Annual Survey of Manufactures.

[2] Estimate.

[3] Forecast.

[4] Value of all products and services sold by establishments in the musical instruments industry.

[5] Value of products classified in the musical instruments industry produced by all industries.

SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA). Estimates and forecasts by ITA.

playing acoustic and electric guitars. Also contributing to the demand for guitars were the growing numbers of serious buyers between the ages of 35 and 40, trading up to high-end, high-quality instruments. The cheaper, imported acoustic and electronic guitars generally are purchased by adults under 30. Sales increases shown for percussion instruments were primarily due to price increases.

However, the moderate growth in acoustic guitars and percussion instruments was more than offset by decreased demand for vertical pianos, grand pianos, organs, and parts. Based on the 1987 Census of Manufactures, the last year for which detailed data are available, pianos, organs, and parts accounted for 37 percent of total U.S. product shipments of musical instruments.

The decline in domestic shipments for these categories was primarily due to the rising number of low-priced electronic keyboards imported from Japan and other Asian countries. Industry sources report that the increase in these imports could result in trade-ups in the long run by creating demand for higher quality U.S.-made products, such as acoustic pianos. Shipments of school band and orchestral instruments remained constant in 1990. According to industry association representatives, the lack of growth reflects the stable number of students participating in school music programs.

New products and improved technology continue to affect the musical instruments industry. For example, a Japanese company has developed a piano called a Disklavier with added sensors and electromagnetic devices that measure percussion, timing, and tone of the notes being played. The information is stored on a computer disk and can be played back. The Disklavier is aimed at the professional market; however, it is being purchased by amateur users. The price of the Disklavier ranges from $7,000 for a simple upright piano to $26,000 for a concert grand.

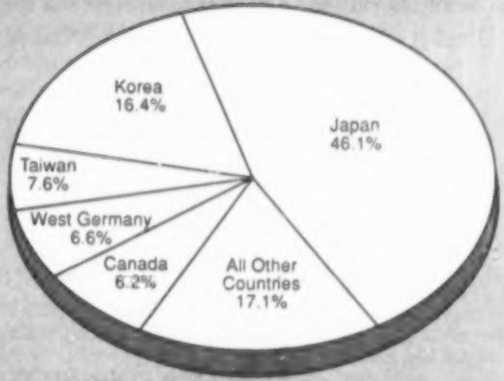
In 1990, the number of U.S. workers employed in the production of musical instruments declined an estimated 3.4 percent to nearly 8,400 workers from 8,700 in 1989. Their average hourly wages rose an estimated 3 percent, to $9.03 from $8.77 in 1989.

INTERNATIONAL COMPETITIVENESS

In 1990, U.S. imports of musical instruments increased to $766 million, up an estimated 5 percent. As a result, the import penetration advanced to an estimated 57.7 percent compared with 55.7 percent in 1989. Again, Japan was the major supplier of all musical instruments to the United States, accounting for nearly half of total imports. Other major suppliers were South Korea, Taiwan, and West Germany. Together, these four countries accounted for over three-fourths of the estimated total value of imports as shown in Figure 2.

U.S. exports of musical instruments continued their upward trend for the fifth consecutive year, reaching an estimated $251 million in 1990, up 12 percent from 1989 when exports were $224 million, as shown in table 1. Industry experts attributed the increase to favorable exchange rates. Dominating exports were acoustic guitars, acoustic pianos, string instruments, percussion instruments, and electronic synthesizers and keyboards, all of which exhibited substantial growth rates. Major U.S. markets for exports of musical instruments were Japan, the United Kingdom, West Germany, and Canada.

Figure 39-2
Major Suppliers of Musical Instruments, 1990 Estimates



Source: U.S. Department of Commerce, International Trade Administration.

Table 1: U.S. Exports of Musical Instruments F.A.S. Value

(thousands of dollars)

Year	Value	Percent Change
1990*	$251,236	12.0
1989	224,318	11.1
1988	201,956	29.2
1987	156,274	48.3
1986	105,408	21.5
1985	86,732	−11.4

*Estimate.
SOURCE: U.S. Department of Commerce, International Trade Administration.

Outlook for 1991

Shipments by the musical instrument industry are expected to be stable in 1991. The constant dollar value of product shipments is projected to decline 6 percent. Nevertheless, demand for imported, high-priced musical instruments, such as pianos, will continue to rise. Imported pianos are generally less expensive than domestically made instruments, and their quality has improved substantially over the past few years.

Projections about continued growth for U.S. exports are optimistic. Favorable exchange rates will help spur exports, and stable prices will help the industry remain competitive abroad.

Long-Term Prospects

U.S. shipments of musical instruments are expected to increase less than 1 percent annually, from 1991 to 1995, after adjusting for inflation. The Bureau of the Census reports somewhat favorable demographics for 1990–95; the number of children between the ages of 8 and 17, the major market for musical instruments, is projected to rise to 37 million, up 1.4 percent, compounded annually. The Census

Bureau also projects a compound annual growth rate of less than 1 percent for the number of children between 5 and 10 years of age, with an increase of nearly 22.6 million. Parents of these children are the major purchasers of pianos. However, decreases in real personal disposable income coupled with any increase in interest rates could offset growth potential for this industry.

The political and economic changes in Eastern Europe and the opening up of this large market could give a boost to the music industry. Domestic manufacturers of musical instruments may have opportunities to establish joint ventures or to expand exports to Eastern Europe.—*Judith Corea, Office of Consumer Goods, (202)377-0311, September 1990.*

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(Call the Bureau of the Census at 301-763-4100 for information about how to order Census documents.)

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Projections of the Population of the United States, by Age, Sex, and Race: 1988 to 2080, Bureau of the Census, U.S. Department of Commerce, Washington, DC 20233. Telephone: (301) 763-1902.

Producer Price Indexes, Bureau of Labor Statistics, U.S. Department of Labor, Washington, DC 20221. Telephone: (202) 523-1327.

The Music Trades, Music Trade Corporation, 80 West Street, P.O. Box 432, Englewood, New Jersey 07631. Telephone: (201) 871-1965.

Up Beat, Maher Publications, Inc., 180 West Park Avenue, Elmhurst, IL 60126. Telephone: (312) 580-7798.

American Music Conference Statistical Report, 1989, American Music Conference, 150 East Huron Street, Chicago, IL 60611. Telephone: (312)856-8820.

DOLLS, TOYS, GAMES, AND CHILDREN'S VEHICLES

In 1990 industry shipments of dolls, toys, and games fell an estimated 0.9 percent to $4.2 billion. The constant-dollar value of doll shipments fell 3.5 percent, while shipments of toys and games dropped an estimated 4.2 percent.

The lack of a hit toy product and the continued success of video games negatively affected U.S. toy and game shipments in 1990. According to industry sources, demand has shifted away from traditional toys to video games and other nontraditional toys. Since virtually all video games are imported, the growth in that category has hurt U.S. producers' shipments, which are mostly of traditional toys.

In 1990, electronic video games were the top selling toy and game category, continuing its rebound that started around 1985. About one-fourth of the more than 90 million households in the United States own a video game. Retail sales in this segment of the industry exceeded $4 billion in 1989 and in 1990 home video game sales were estimated to reach $5 billion. Three firms dominate the market, with one firm accounting for 80 to 90 percent of all video game sales.

During the past year, sales of some traditional toy lines, such as preschool toys, board games, and puzzles declined. Contributing to the decline was the slowed growth in the number of children between the ages of 1 and 9, as well as slow personal disposable income growth. Between 1989 and 1990, children in this age group rose 0.49 percent, compared with growth of 0.84 percent for the total popu-

Trends and Forecasts: Dolls, Toys, and Games (SIC 3942,3944)

(in millions of dollars except as noted)

Item	1987	1988[1]	1989[2]	1990[2]	1991[3]	Percent Change 1987-88	1988-89	1989-90	1990-91
Industry Data									
Value of shipments[4]	3,675	4,246	4,235	4,198	—	15.5	−0.3	−0.9	—
3942 Dolls and stuffed toys	294	272	269	266	—	−7.5	−1.1	−1.1	—
3944 Games & toys	3,381	3,974	3,966	3,932	—	17.5	−0.2	−0.9	—
Value of shipments (1987$)	3,675	4,105	3,906	3,744	3,669	11.7	−4.8	−4.1	−2.0
3942 Dolls and stuffed toys	294	265	258	249	244	−9.9	−2.6	−3.5	−2.0
3944 Games & toys	3,381	3,840	3,648	3,495	3,425	13.6	−5.0	−4.2	−2.0
Total employment (000)	35.3	38.4	38.0	37.[illegible]	—	8.8	−1.0	−1.8	—
3942 Dolls and stuffed toys	4.4	3.9	4.2	4.1	—	−11.4	7.7	−2.4	—
3944 Games & toys	30.9	34.5	33.8	33.2	—	11.7	−2.0	−1.8	—
Production workers (000)	27.0	30.0	29.0	27.7	—	11.1	−3.3	−4.5	—
3942 Dolls and stuffed toys	3.3	3.1	3.0	3.0	—	−6.1	−3.2	0.0	—
3944 Games & toys	23.7	26.9	26.0	24.7	—	13.5	−3.3	−5.0	—
Average hourly earnings ($)	7.14	7.24	7.61	8.[illegible]	—	1.4	5.1	5.1	—
3942 Dolls and stuffed toys	5.44	5.80	6.10	6.40	—	6.6	5.2	4.9	—
3944 Games & toys	7.35	7.40	7.77	8.15	—	0.7	5.0	4.9	—
Capital expenditures	96.6	98.8	—	—	—	0.2	—	—	—
3942 Dolls and stuffed toys	4.4	2.3	—	—	—	−47.7	—	—	—
3944 Games & toys	94.2	96.5	—	—	—	2.4	—	—	—
Product Data									
Value of shipments[5]	3,302	3,784	3,764	3,730	—	14.6	−0.5	−0.9	—
3942 Dolls and stuffed toys	305	334	329	325	—	9.5	−1.5	−1.2	—
3944 Games & toys	2,997	3,450	3,436	3,405	—	15.1	−0.4	−0.9	—
Value of shipments (1987$)	3,302	3,661	3,485	3,341	3,274	10.9	−4.8	−4.1	−2.0
3942 Dolls and stuffed toys	305	324	315	304	298	6.2	−2.8	−3.5	−2.0
3944 Games & toys	2,997	3,337	3,170	3,037	2,976	11.3	−5.0	−4.2	−2.0

[1] Advance data from the 1988 Annual Survey of Manufactures.

[2] Estimate.

[3] Forecast.

[4] Value of all products and services sold by establishments in the dolls, toys, and games industry.

[5] Value of products classified in the dolls, toys, and games industry produced by all industries.

SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA). Estimates and forecasts by ITA.

lation. The low growth for the number of children in this age group combined with consumer uncertainty and slow personal disposable income growth may have contributed to the decline in shipments.

Unlike most toys, preschool toys, puzzles, and board games are not seasonal and are purchased throughout the year. The two-income, higher-educated parents, who are older and wealthier than previous generations, are interested in the more basic, traditional toys that are safe and have more educational and play value. Moreover, couples today have smaller families than their counterparts a generation ago. As a result, more dollars are spent on each child. These factors have slowed the decline in shipments in this segment of the industry to some extent.

Production of vinyl, collectable dolls has increased over the past year. These dolls are more affordable than dolls made of porcelain. Collectible dolls are also less susceptible to fluctuations in the overall economy than are other dolls and stuffed toys, which are mostly imported. Therefore, the greater share of these dolls in U.S. product shipments has lessened the decline in this segment of the industry to some extent.

Total employment in the dolls, toys, and games industry declined an estimated 2 percent to 37,300 employees in 1990, while employment of production workers fell an estimated 4.5 percent to about 27,000 workers. The decline is attributed to strong import competition and the continued movement of domestic manufacturers to off-shore production sites, especially in the Far East. This downward trend is expected to continue. Average hourly earnings for production workers in this industry remained low relative to other industries, but increased by 5 percent to $8.00, from $7.61 in 1989.

INTERNATIONAL COMPETITIVENESS

U.S. demand for dolls, toys, and games is increasingly being met by imports, particularly from the Far East. In 1990, the ratio of imports to apparent consumption of dolls was estimated at about 89 percent and for toys, 65 percent. These ratios increased from the previous year when the levels were 84 percent and 58 percent, respectively.

The increase in imports was led by video game systems and parts that rose an estimated 27 percent. Japan was the major supplying country of video games, accounting for over 90 percent of total imports. In 1990, U.S. imports of dolls increased to $1.8 billion, up an estimated 25 percent from 1989. The increase was attributed to rising demand in the U.S. market for fashion dolls and stuffed dolls and animals. Toys and games also showed growth, increasing to $5.8 billion, up 40 percent for the same period. China and Taiwan were major suppliers of nonelectronic toys and games, accounting for an estimated 28 percent of such imports. Nearly all major American producers operate facilities in Hong Kong, South Korea, and Taiwan, enabling them to take advantage of the lower labor rates. Besides owning production facilities in these countries, many U.S. producers have contracting and licensing agreements with foreign producers.

In 1990, President Bush announced an extension of most favored nation (MFN) status to China. Currently, China provides close to half of all doll imports and about one fifth of all toy and game imports to the United States. Industry perception regarding the future stability of the Chinese economy may lead manufacturers to explore opportunities in other countries, such as Thailand and the Philippines.

Historically, U.S. exports have comprised a relatively small percentage of the total value of U.S. product shipments of dolls, toys, and games. However, in 1990, U.S. exports rose to 14 percent of product shipments, from 6.9 percent in 1986. Exports of toys rose for the fifth consecutive year, advancing an estimated 44 percent in 1990 to $475 million. During this period, the value of U.S. doll exports dropped an estimated 11 percent to about $48 million. The major markets for these products were Mexico, Canada, and Western Europe. U.S. companies are increasingly exporting parts and accessories of dolls, toys, and games to Mexico for further processing.

Outlook for 1991

In 1991, the real value of U.S. product shipments of dolls, toys, and games is expected to decline 2 percent attributable to slow growth of real personal disposable income and stable demographics. Also, the Bureau of the Census reported that from 1990 to 1991, the number of children between 1 and 9 years of age was expected to grow by only 0.5 percent.

Sales of video games are expected to increase. Companies involved in home video games are continually trying to find ways to expand the market base by targeting different groups such as women, girls, and the preschool population. Traditional toys will continue to interest the parents of children between 1 and 9 years of age.

Long-Term Prospects

Between 1990 and 1995 U.S. shipments of dolls, toys, and games are expected to decline downward by less than 1 percent, compounded annually, due to stable demographics and slow growth in personal disposable income. The Bureau of the Census reports that the number of children under the age of 10 is projected to fall to 36.6 million between 1990 and 1995, down 0.6 percent, compounded annually. However, Census forecasts a compound annual population growth rate of almost 2 percent for children between 10 and 14 years of age, to about 19 million. U.S. imports will continue to account for most sales in the domestic market. The industry will continue to consolidate and diversify, expanding product lines for such items as doll accessories, children's back packs, and children's clothing.

The privatization of Eastern European economies may provide future production sites for major toy manufacturers. Domestic manufacturers of dolls, toys, and games may have opportunities to establish joint ventures in these new markets. The unification of the European Community set for 1992 and the removal of trade barriers between the United States and Canada could provide additional export opportunities for U.S. manufacturers of dolls, toys, and games.—*Judith Corea, Office of Consumer Goods, (202) 377-0311, September 1990.*

Additional References

(Call the Bureau of the Census at 301-763-4100 for information about how to order Census documents.)

Dolls, Toys, & Games, 1987 Census of Manufacturers, MC87-1-39B, Bureau of the Census, U.S. Department of Commerce, Washington, DC 20233. Telephone: (301) 763-2412.

Projections of the Population of the United States, by Age, Sex, and Race: 1988 to 2080, Bureau of the Census, U.S. Department of Commerce, Washington, DC 20233. Telephone: (301) 763-1902.

Nintendo of America, Inc.

Sales of video games are expected to increase in 1991. In the long term, domestic manufacturers of dolls, toys, and games may find new marketing opportunities in Europe.

Producer Price Indexes, Bureau of Labor Statistics, U.S. Department of Labor, Washington, DC 20221. Telephone: (202) 523-1327.

Playthings, Geyer-McAllister Publications Inc., 51 Madison Avenue, New York, NY 10010. Telephone: (212) 689-4411.

Toy and Hobby World, International Thomson Retail Press, 343 Park Avenue South, New York, NY 10010. Telephone: (212) 686-7744.

BICYCLES

Constant-dollar product shipments of bicycles and parts increased an estimated 6 percent in 1990, due in large part to an estimated 146 percent increase in exports. Imports grew an estimated 5 percent in 1990. The domestic market was relatively flat, reflecting a slowdown in the overall economy.

In 1990, the domestic market experienced relatively soft demand reflecting the economy's slower growth rate. Real disposable income grew an estimated 1.2 percent during the first 6 months of 1990 down from 2.4 percent growth in 1989. The weak growth in personal income coincided with an increase in personal savings, resulting in an estimated 9 percent increase of the saving to personal income ratio for the first 6 months of 1990. With little growth available for personal consumption expenditures, real expenditures on bicycles were virtually unchanged in the first 6 months of 1990.

In 1988 bicycling became the third most popular sporting activity in the country, according the National Sporting Goods Association. The sport attracted 5.6 million new participants in 1989, bringing the total number of bikers to 56.9 million. The industry benefited over the last several years from the increased attention by the media and the advent of multisport racing.

Bicycle models sold in the United States are undergoing significant changes. From the 1970s until the last few years, lightweight racing-style bicycles with thin tires and curved handlebars dominated the consumer market, accounting for 56 percent of the market in 1979, and averaging approximately 50 percent from 1980-1987. Children's bicycles and the "other bicycles" categories averaged 40 percent and 10 percent, respectively. However, mountain bikes and all-terrain bicycles (ATBs), both in the "other bicycles" category, have grown in popularity since 1987, cutting into the sales of lightweight and children's bikes. In 1989, the "other bicycles" category accounted for 32.2 percent while the children's bike category and the lightweight bicycle category accounted for 35.8 percent and 32 percent of the domestic market, respectively, according to the Bicycle Manufacuturers Association of America (BMA).

Over the last few years, consumers have been opting for comfort over speed, which is the main draw of lightweights. ATBs have wide tires, which make for a smoother ride, and higher handlebars, which place riders in a more comfortable position. In response to this shift in consumer preferences, U.S. manufacturers are now offering ATBs with lightweight frames; these bicycles are nearly as light as the traditional lightweights but possess the tires and handlebars of the mountain and all-terrain bikes.

INTERNATIONAL COMPETITIVENESS

Since the early 1950s, the U.S. bicycle industry has faced stiff import competition. Several U.S. companies have moved all or most of their production operations overseas. In 1990, imports of bicycles and parts totaled an estimated $701 million, up from $681 million in 1989. Reflecting the reduction in numbers of imported bicycles, the market share of bikes produced by foreign manufacturers and sold in the U.S. market has dropped from 59 percent in 1987 to 50 percent in 1989, according to the Bicycle Manufacturers Association of America. U. S. manufacturers gained domestic market share as the dollar weakened vis-a-vis major foreign currencies. The relative price of imported bicycles increased 19 percent from 1987 to 1989.

The modest growth in imports represents an increase in imported bicycle parts and a decline in imported bicycles. In 1990, bicycle imports totaled an estimated $473 million, 15 percent lower than the all-time high in 1987 of $558 million. In 1987, bicycle part imports were $174 million; in 1990 they were estimated at $228 million, a 31 percent increase. Many bicycle components are no longer made in the United States, therefore, and domestic producers must import parts to maintain or increase production. Producers have sought and received tariff relief for those parts that are not manufactured in the United States.

Taiwan is the largest foreign supplier of bicycles and parts, accounting for an estimated 80 percent of total U.S. imports in 1990. South Korea is the second largest supplier. However, that country's import share has declined from 12 percent in 1988 to an estimated 6 percent in 1990. The countries that have gained the most import share are China and Thailand. China's share of U.S. imports grew from 0.7 percent in 1988 to an estimated 5.3 percent in 1990, and Thailand's share of U.S. imports grew from 0.1 percent to an estimated 1.6 percent.

Total U.S. exports of bicycles and parts rose to $113 million in 1990, an estimated 146 percent increase over $46 million in 1989. This growth exceeded the annual growth between 1987 and 1989 of 87 percent. Although this industry traditionally has not been export-oriented, the lower value of the dollar vis-a-vis foreign currencies has encouraged several manufacturers to pursue export opportunities. As a result, the exports to product shipments ratio rose substantually, from 2 percent in 1987 to 18 percent in 1990.

Japan and Canada are the largest markets for U.S. bicycle exports. Some U.S. producers of mountain and children's bikes have successfully penetrated the Japanese market, which has a strong domestic industry. U.S. exports to Canada have benefited from the initial reductions of the 10-year, staged phase-out of tariffs on bicycles and parts called for in the U.S.-Canadian Free Trade Agreement enacted in 1989.

Outlook for 1991

Constant-dollar product shipments of bicycles and parts are forecast to rise at an estimated 2 percent rate this year. Exports will continue to be the biggest growth sector, increasing an estimated 28 percent in 1991. Imports of bicycles and parts will increase by an estimated 3 percent, with imports of bicycles declining an estimated 2 percent and imports of bicycle parts increasing an estimated 10 percent. The domestic market is expected to increase only slightly due to the continued slower growth of the economy.

Long-Term Prospects

Real product shipments are expected to grow 4 percent annually over the next five years. The growth of bicycle sales will be affected by several factors: continued growth of exports; favorable demographics; increased attention by media and new sporting events; the emergence of bicycle safety issues; the continuing development of bicycle riding routes and paths; and finally, the use of bicycles for basic transportation.

Foreign demand for U.S. bicycles is expected to remain strong. Several foreign economies, such as the Japanese and German, are likely to continue growing at a rapid rate. The Organization for Economic Cooperation and Development reports that Japan's and Germany's GDP should grow at an estimated annual rate of 4 percent and 3.4 percent, respectively in 1991, and are expected to continue to grow during the next 5 years.

Adults between the ages of 25 and 40 years make up the second fastest growing sector of the population. This group helped fuel the growth of the lightweight bicycle market when they were younger, and many bike enthusiasts are rediscovering the sport through a new product, the ATB or mountain bike.

The industry benefited from increased attention to the sport by the media and the advent of multisport racing. These factors should continue to increase the sports visibility and

Table 2: SIC 37511, Bicycles and Parts: Domestic Shipments and Trade

(in millions of dollars except as noted)

					Percent Change		
	1987	1988[1]	1989[1]	1990[2]	1987–88	1988–89	1989–90
Product Shipments	536	553	579	636	3.2	4.7	9.8
Product Shipments (87$)	536	521	522	554	−2.8	0.3	6.1
Apparent Consumption[3]	1,255	1,173	1,214	1,224	−6.5	3.5	0.8
Imports	732	641	681	701	−12.4	6.2	2.9
Imports to App. Con.(%)	58	55	56	57	−5.2	0.2	0.2
Exports	13	21	46	113	56.5	123.4	146.5
Exports to Shipments(%)	2.4	3.8	7.9	17.6	58.3	107.9	122.8

[1] Estimated Product Shipments.

[2] Estimated Trade and Product Shipments.

[3] Apparent Consumption = Product Shipments − Exports + Imports.

SOURCE: Department of Commerce, Bureau of Economic Analysis.

attract new participants. Multisports races, like thriathlons, introduce new athletes, especially runners, to bicycling.

The use of bicycles for basic transportation may also increase as a result of highway congestion and environmental concerns. Those individuals who have the opportunity to commute to work by bicycle may be encouraged to do so as a way to conserve fuel and save money if gasoline prices rise. Bicycle sales increased during the oil crisis of the late 1970s. In addition, bicycling is a pollution-free form of transportation.

The BMA asserts that the continued development of bicycle routes and paths will have a positive effect on bicycle sales. Public roads and sidewalks often become congested and dangerous for bikers. The development of new bike routes should increase confidence in bicycle safety, and providing more enjoyable and safe paths should entice additional consumers to purchase a bicycle.

Bicycle safety issues may hamper future sales. A safety concern currently being debated is the mandatory use of bicycle helmets to prevent serious head injuries. Last year, a county in Maryland passed the first mandatory bicycle helmet law for all riders, and the Consumer Product Safety Commission has begun a study analyzing the quality standards for these helmets.—*John A. Vanderwolf, Office of Consumer Goods, (202) 377-0348, September 1990.*

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(Call the Bureau of the Census at 301-763-4100 for information about how to order Census documents.)

Ship and Boat Building, Railroad and Miscellaneous Transportation Equipment, SIC 3751, 1987 Census of Manufactures, Series MC87-I-37C, (quinquennial). Bureau of the Census, U.S. Department of Commerce, Washington, DC 20233. Telephone: (301) 763-7304.

1987 Census of Retail Trade, SIC 5941, Sporting Goods Stores and Bicycle Shops, Retail, Series RC87-A-52, (quinquennial). Bureau of the Census, U.S. Department of Commerce, Washington, DC 20233. Telephone: (301) 763-7304.

Personal Consumption Expenditures, "Wheeled Goods," Bureau of Economic Analysis, U.S. Department of Commerce, Washington, DC 20233. Telephone: (202) 523-0778.

American Bicyclist and Motorcyclist, 80 Eighth Ave., New York, NY 10011. Telephone: (212) 206-7230.

Bicycle Business Journal, 1904 Wenneca Street, Fort Worth, TX 76102. Telephone: (817) 870-0341.

Bicycling Magazine, 33 E. Minor Street, Emmaus, PA 18049. Telephone: (215) 967-5171.

The 1989 Bicycle Market in Review, Bicycle Manufacturers Association, 1055 Thomas Jefferson St., NW, Washington, DC 20007. Telephone: (202) 333-4052.

The Sporting Goods Market in 1990, National Sporting Goods Association, Mt. Prospect, IL 60056. Telephone: (708) 439-4000.

Sports Participation in 1989, National Sporting Goods Association, Mt. Prospect, IL 60056. Telephone: (708) 439-4000.

Sports Trend, Shore Communications Inc., Suite 300, N Building, 180 Allen Rd. NE, Atlanta, GA 30328. Telephone: (404) 252-8831.

MOTORCYCLES

Constant-dollar product shipments of motorcycles and parts increased an estimated 7 percent in 1990, due solely to an estimated 43 percent increase in exports. U.S. constant-dollar product shipments to the domestic market fell an estimated 8 percent. Imports—mainly from Japan—declined an estimated 22 percent from 1989. Apparent consumption of motorcycles and parts also fell by an estimated 17 percent in 1990. Domestic employment in the industry increased an estimated 4 percent due in large part to the growth of production for export.

The declining domestic market for motorcycles is documented by falling motorcycle registrations. The Motorcycle Industry Council (MIC) reported a 28 percent decline in newly registered motorcycles in 1989. In 1980, the total number of motorcycles registered in the United States was 5.6 million; this figure has dropped steadily to 4.2 million in 1989.

Consumers are not as attracted to motorcycling as they once were in the early 1980s, despite increases in real disposable income over the decade at an annual rate of 3 percent. Over the same period, expenditures for motorcycles, bicycles, toys, and sporting goods grew at an annual rate of 5 percent. Meanwhile, motorcycle unit retail sales fell at an annual rate of 12 percent.

Consumers' perceptions of motorcycle safety may be the most important factor influencing this sales decrease. During much of the 1970s and early 1980s, motorcycle riding was perceived as a challenging and enjoyable mode of transportation. This view is not as prevalent today. Several laws and regulations have been enacted drawing attention to the possible dangers of motorcycle riding. Mandatory motorcycle helmet laws now exist in all but 3 states. In addition, the Consumer Product Safety Commission has banned all sales of 3-wheeled all-terrain vehicles (ATVs), a product similar to motorcycles.

The low price of fuel also reduced the attractiveness of motorcycles as a mode of transportation relative to auto-

Trends and Forecasts: Motorcycles, Bicycles, and Parts (SIC 3751)

(in millions of dollars except as noted)

Item	1987	1988[1]	1989[2]	1990[2]	1991[3]	Percent Change 1987-88	1988-89	1989-90	1990-91
Industry Data									
Value of shipments[4]	1,063	1,057	1,078	1,219	—	−0.6	2.0	13.1	—
Value of shipments (1987$)	1,063	1,024	1,011	1,100	1,119	−3.7	−1.3	8.8	1.7
Total employment (000)	7.4	7.5	7.5	7.5	—	1.4	0.0	0.0	—
Production workers (000)	5.8	5.8	5.8	5.9	—	0.0	0.0	1.7	—
Average hourly earnings ($)	9.17	9.62	9.62	9.65	—	4.9	0.0	0.3	—
Capital expenditures	30.7	16.7	—	—	—	−45.6	—	—	—
Product Data									
Value of shipments[5]	1,152	1,191	1,197	1,351	—	3.4	0.5	12.9	—
Value of shipments (1987$)	1,152	1,147	1,107	1,203	1,224	−0.4	−3.5	8.7	1.7

[1] Advance data from the 1988 Annual Survey of Manufactures.

[2] Estimate.

[3] Forecast.

[4] Value of all products and services sold by establishments in the motorcycles, bicycles, and parts industry.

[5] Value of products classified in the motorcycles, bicycles, and parts industry produced by all industries.

SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA). Estimates and forecasts by ITA.

mobiles and trucks in the 1980s. Motorcycles have traditionally sold well during an energy crisis because of their high gas mileage. In 1973, in the midst of the OPEC oil embargo, new motorcycle registrations reached an all-time high. On average, motorcycles used on-highway are about twice as fuel efficient as most new automobiles, according to the MIC. However, lower oil prices in the 1980s may have altered consumers' preferences for vehicles. The number of miles traveled by motorcycle for communting has decreased 32 percent, from 3.1 million miles in 1980 to 2.1 million in 1989.

As a result of the decrease in new ridership over the last 5-to-10 years, the major Japanese manufacturers, who account for nearly 90 percent of the U.S. market, have expanded their product lines and introduced new small engine products such as ATVs, personal watercraft, lawn equipment, and power generators. These new products attract consumers other than motorcycle enthusiasts, helping to broaden the customer base.

INTERNATIONAL COMPETITIVENESS

In 1990, U.S. imports of motorcycles totaled an estimated $500 million, a 22 percent decline from 1989. Japan is the largest foreign supplier of motorcycles, accounting for 88 percent of total U.S. imports. U.S. imports from Japan dropped by an estimated 42 percent in 1990, partly because two Japanese motorcycle companies with production facilities in the United States have supplanted imports with domestic products. The dramatic decrease of Japanese imports began in 1986, one year after the depreciation of the U.S. dollar began.

Domestic production has become more price-competitive as imports decreased to 63 percent of apparent consumption in 1990 from more than 70 percent in the early 1980s. From February 26, 1985, to July 20, 1990, the dollar's value fell 43 percent against the yen, increasing the price of motorcycles imported from Japan. While Japanese products were affected by exchange rate fluctuations, European products remained competitive, as U.S. imports from Europe increased 107 percent in 1990. Many European products have niche markets that are less affected by price changes.

The exports-to-shipment ratio for 1990 was estimated at 49 percent, a 28 percent increase over 1989. Increasing U.S. exports in the 1980s have helped domestic manufacturers sustain a profitable level of production despite decreases in U.S. consumption. The lower value of the dollar combined with increasing operating efficiencies have made exporting profitable for domestic manufacturers.

West Germany was the largest export market for U.S. motorcycles, totaling an estimated $59 million in 1990. The second largest foreign market for U.S. exports was Japan, totaling an estimated $51 million. Canada, the Netherlands, and the United Kingdom were also major markets for U.S. motorcycles.

Outlook for 1991

Constant dollar product shipments of motorcycles and parts are forecast to increase 1.3 percent in 1991. Exports will continue to be the driving force behind production, as they are expected to increase 6.3 percent in 1991. Imports are projected to fall an additional 9 percent. Domestic production for the U.S. market will decline slightly, as the demand for motorcycles continues to fall. The economy's slower growth and the continued lack of interest in motorcycles due to the perceived safety concerns will be the major factors slowing domestic demand. These projections may be partially offset by increased demand for motorcycles due to their fuel efficiency should gasoline prices remain high as a result of international tensions.

Long-Term Prospects

Real domestic product shipments are expected to grow at a rate of 1 percent, mainly because of the strength in the export sector. The domestic market will continue to exhibit weak demand for motorcycles. Unless altered, the perception of danger associated with motorcycle riding will continue to have a negative effect on sales. Manufacturers and dealers hope efforts to attract the aging baby boomers will stimulate demand.

Foreign demand for motorcycles is expected to remain strong. Germany and Japan should continue to be the strongest foreign markets for U.S. motorcycles. Increased fuel prices may have a greater effect on foreign than domestic markets due to existing high prices.

The industry foresees an improvement in the consumer's perception of motorcycle safety over the next several years. The declining rate of motorcycle accidents is an important factor in improving the perception of motorcycle safety. In 1988, the number of motorcycle accidents per 10,000 registered motorcycles dropped 13 percent from its peak in 1985. In addition, the Motorcycle Safety Foundation has formed country-wide motorcycle rider education programs, which the industry believes will improve the safe use of its products.

As a way to increase ridership, motorcycle manufacturers and dealers are trying to offer more products that may appeal to the 1950s baby boom generation. Despite weak sales to this population group in the 1980s, the group is now entering a

Table 3: SIC 37512, Motorcycles and Parts: Domestic Shipments and Trade

(in millions of dollars except as noted)

	1987	1988[1]	1989[1]	1990[2]	Percent Change 1987-88	Percent Change 1988-89	Percent Change 1989-90
Product Shipments	503	489	519	578	1.6	3.2	11.4
Product Shipments (87$)	496	482	493	527	0.2	−0.6	6.9
Apparent Consumption3	942	928	957	795	−4.0	1.6	−16.9
Imports	610	659	637	500	8.0	−3.3	−21.5
Imports to App. Con.(%)	70	71	67	63	12.9	−4.3	−6.0
Exports	124	220	199	284	78.0	−9.6	42.5
Exports to Shipments(%)	44	45	38	49	76.0	−73.6	28.9

[1] Estimated Product Shipments.

[2] Estimated Trade and Product Shipments.

[3] Apparent Consumption = Product Shipments − Exports + Imports.

SOURCE: U.S. Department of Commerce: Bureau of the Census, International Trade Administration (ITA).

stage in life where, traditionally, their disposable income is at its highest level and they purchase more luxury items. Manufacturers and dealers have had success selling large heavyweight motorcycles to this age group over (40s and 50s) the last few years. Such successes may typify the demand in the 1990s.—*John A. Vanderwolf, Office of Consumer Goods, (202) 377-0348, September 1990.*

Additional References

(Call the Bureau of the Census at 301-763-4100 for information about how to order Census documents.)

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The 1990 Motorcycle Statistical Annual, Motorcycle Industry Council, 2 Jenner Street, Suite 150, Irvine, CA 92718. Telephone: (714) 727-4211.

Dealernews, Edgell Communications, Inc., P.O. Box 19531, Irvine, CA 92714. Telephone: (800) 346-0085.

Motorcycle Product News, P.O. Box 2338, 6633 Odessa Ave., Van Nuys, CA 91406. Telephone: (818) 997-0644.

BOAT BUILDING AND REPAIRING

Included in SIC 3732 are commercial and military boats as well as private pleasure boats. Boat building and repairing does not cover ships, ship repairing, marine accessories, and water sports products like water skis and sailboards. Pleasure boats make up the bulk of shipments and will be the focus of this outlook.

The boat building industry has experienced two recessionary years as constant dollar product shipments declined an estimated 13 percent annually in 1989 and 1990. However, this decline followed a period of rapid growth between 1982 and 1988 when constant dollar shipments increased 13 percent annually. Current dollar product shipments peaked at approximately $5.9 billion in 1988, before falling to an estimated $4.8 billion in 1990. Imports have been affected as well. From 1988 to 1990, imports fell 48 percent to an estimated $270 million, their lowest level since 1983. However, exports have been rising since 1984, reaching a new high estimated at $814 million (17 percent of produc shipments) in 1990.

As a result of the decline in shipments, the industry has cut employment 6.1 percent in 1989 and 8.8 percent in the first 6 months of 1990, down from a high of 62,800 in 1988. Layoffs were especially severe for production workers, whose employment fell 6.9 and 9.5 percent in 1989 and the first 6 months of 1990, respectively.

Declines in domestic production are a result of a weak domestic demand for pleasure boats in 1989 and 1990. The demand for pleasure boats was affected by slower growth in personal income, higher personal savings rates, consumers' reluctance to take on additional debt, and relatively high interest rates. From 1982-1988, real disposable personal income grew at an annual rate of 3.6 percent while real personal expenditures and shipments of pleasure boats both grew at an annual rate of 13 percent. However, real annual growth of disposable personal income slowed to 2.4 and 1.2 percent in 1989 and the first 6 months of 1990, respectively.

In addition, higher rates of savings contributed to a decline in pleasure boat shipments. The percent of personal disposable income allocated to savings rose from 2.9 percent in 1987 to an estimated 5.0 percent in 1990. A rise in personal savings relative to income implies less spending on discretionary items like pleasure boats.

Third, the pleasure boat industry may have been affected by consumers' reluctance to take on additional debt. Since the average price of a pleasure boat is more than $8,000, the purchase is almost always financed, and interest rates play a significant role in the purchase decision. Although pleasure boat sales do not always follow minor fluctuations in interest rates, the rates do appear to have some effect on sales (see Figure 3). Since 1982, the ratio of consumer installment debt to personal income rose from just under 12 percent to nearly 16 percent in January 1989. From that point, consumers have tried to reduce their debt burden. In June 1990, the ratio dropped to 15.38 percent as consumers increased their interest payments to businesses by 9 and 5 percent annually in 1989 and the first 6 months of 1990, respectively. The consumer debt ratio may also have declined because of the continued phased elimination of the tax deduction for personal interest, raising the net cost of items bought on credit.

Trends and Forecasts: Boat Building and Repairing (SIC 3732)

(in millions of dollars except as noted)

Item	1987	1988[1]	1989[2]	1990[2]	1991[3]	Percent Change 1987-88	1988-89	1989-90	1990-91
Industry Data									
Value of shipments[4]	5,353	5,935	5,358	4,892	—	10.9	−9.7	−8.7	—
Value of shipments (1987$)	5,353	5,740	4,994	436	4,085	7.2	−13.0	−12.7	−6.3
Total employment (000)	57.2	62.8	59.0	53.8	—	9.8	−6.1	−8.8	—
Production workers (000)	47.1	51.9	48.3	43.7	—	10.2	−6.9	−9.5	—
Average hourly earnings ($)	8.13	7.23	8.70	9.00	—	1.2	5.7	3.4	—
Capital expenditures	134	135	—	—	—	0.7	—	—	—
Product Data									
Value of shipments[5]	5,219	5,896	5,250	4,795	—	13.0	−11.0	−8.7	—
Value of shipments (1987$)	5,219	5,719	4,893	4,274	4,002	9.6	−14.4	−12.7	−6.4

[1] Advance data from the 1988 Annual Survey of Manufactures.

[2] Estimate.

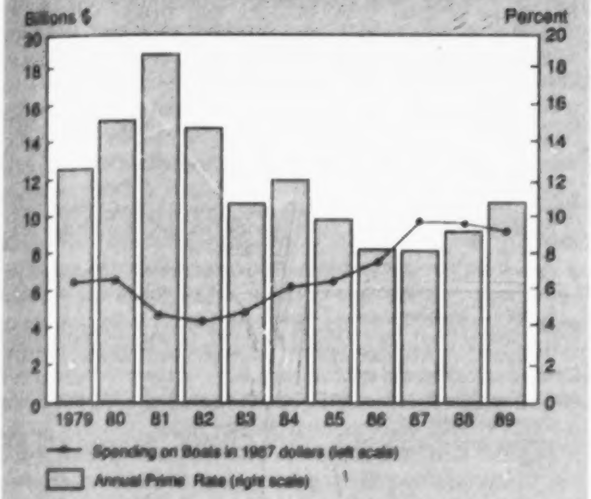
[3] Forecast.

[4] Value of all products and services sold by establishments in the boat building and repairing industry.

[5] Value of products classified in the boat building and repairing industry produced by al industries.

SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA). Estimates and forecasts by ITA.

Figure 39-3
Consumer Spending on Boats Compared to Interest Rates



Source: U.S. Department of Commerce, Bureau of Economic Analysis.

INTERNATIONAL COMPETITIVENESS

The U.S. pleasure boat industry is one of the few consumer goods industries that has an overall trade surplus; it increased to an estimated $544 million in 1990. An estimated 32 percent increase in U.S. exports has contributed significantly to the larger trade surplus. Moreover, with the U.S. market contracting, imports have dropped an estimated 33 percent, also contributing to the larger trade surplus.

U.S. pleasure boat exports have been robust in an otherwise disappointing sales year. Annual exports were close to $100 million through the first half of the 1980s. However, since 1986, exports have experienced double-digit annual growth reaching an estimated level of $814 million in 1990, primarily due to more favorable exchange rates. When the U.S. dollar fell vis-a-vis other major currencies, U.S. pleasure boat manufacturers could offer foreign dealers and distributors more competitive prices. U.S. products have long been desired by foreign dealers and distributors because of their quality, innovations, and special features.

With the decline in the dollar, U.S. manufacturers have become more globally oriented and have placed greater emphasis on the export side of their business. Exports as a percent of U.S. boat shipments have grown from 4.5 percent in 1986 to an estimated 17 percent in 1990. Several firms have begun producing models solely for export.

The major markets for U.S. pleasure boat exports are Canada, Japan, and the European Community countries. Canada is the largest foreign market for U.S. pleasure boats, purchasing an estimated $1150 million of U.S. exports in 1990. The U.S.-Canada Free Trade Agreement, which went into effect in 1989, reduced tariff rates, making the prices of boats manufactured in the United States more competitive. Originally, Canadian tariffs on pleasure boats were 25 percent, but these will be eliminated by 1998. As tariffs are phased out, U.S. manufacturers will become more price-competitive vis-a-vis Canadian firms and other foreign competitors in the Canadian market. Japan is the fastest growing major market for U.S. pleasure boat exports, having increased 106 and 97 percent in 1989 and the first 6 months of 1990, respectively. In the past, Japan restrained the pleasure boat market by levying a luxury tax on boats and restricting areas where pleasure boats could be used. However, many of these restrictions have been lifted since 1988. The lack of marinas and docking areas has also limited growth, but Japan has instituted the Marine '99 project to build several marinas and other marine facilities by the year 2000, bringing the total number of public marinas to 140, housing 60,000 boats, and private marinas to 600, housing 120,000 boats. If successful, this initiative would increase potential Japanese markets even further; however, Japanese developers are concerned that the project requires too much private financing.

Total U.S. imports of pleasure boats decreased by an estimated 33 percent to $270 million in 1990. The contraction of the U.S. market and the decrease in value of the U.S. dollar caused this decline. The low dollar vis-a-vis major currencies during the past 4 years made imports more expensive than domestic products. The major foreign suppliers of pleasure boats are Canada, Taiwan, and Japan.

Outlook for 1991

The short-term prospects for a quick sales recovery do not appear favorable, despite the continued growth of exports. Constant dollar domestic product shipments are forecast to decrease 6.4 percent in 1991. The domestic market will continue to decline more steeply than domestic shipments. Imports will be down approximately 26 percent, and exports will increase by an estimated 22 percent.

Continued sales declines will probably affect the industry's base. With the increase in oil prices, U.S. pleasure boat manufacturer's production costs are likely to rise, since fiberglass, an oil-based product, is such an important component of the finished good. As sales decline and costs increase, some manufacturers may be forced to cut employment and even go out of business.

Long-Term Prospects

The pleasure boat industry should experience 3 percent real growth over the next 5 years, based on favorable demographics and continued strong foreign demand. However, the industry may continue to experience difficulties if the economy enters a recessionary period or taxes increase, thereby causing consumers to defer large discretionary purchases. Also, unaddressed safety issues could affect purchases of boats.

The pleasure boat industry's decline has been influenced mainly by aspects of the overall economy. However, the industry is in the midst of a favorable demographic curve. Most individuals of the baby boom generation are reaching the 30–50 yaar age range, the maximum wage-earning period. During the 1980s the baby boomers were a key factor in the growth of the pleasure boat market; according to a 1988

National Sporting Goods Association demographic survey, people between the ages of 25 and 34 were the most active boating participants, followed by those between 35 and 50. The U.S. pleasure boat industry has been trying to attract these customers as they enter middle age by offering more luxurious and commodious boats, hoping consumers will trade in their smaller and less expensive models. At the same time manufactures are continuing to offer smaller boats to appeal to new boating enthusiasts entering the market.

The opportunity to increase pleasure boat exports over the next five years will depend on continued economic expansion in other countries. The Organization for Economic Cooperation and Development (OECD) reports that Japan's and Germany's GDP should grow at an estimated annual rate of 4 percent and 3.4 percent, respectively in 1991. Continued moderate growth is expected beyond 1991. In addition, the economic changes in Eastern Europe should open new markets over the next five years. The U.S. pleasure boat industry is closely monitoring pending regulatory changes in the European Community (EC) as the member countries unify their markets in 1992. Currently, there is concern in the industry as to what EC standard will be established for imported pleasure boats.

Safety will probably be a major concern of the industry during the next 5 years. Boating does not currently have many of the restrictions of automobile driving, such as mandatory operating licenses. However, with the increasing number of boaters, many areas have become congested, prompting more discussion of safety regulations, enforcement difficulties, and the high rate of alcohol-related accidents.

Finally, the pleasure boat industry is concerned that proposed tax legislation may have a negative impact on sales. Several state and national agencies have proposed taxing pleasure boats as a way to increase government revenues. Proposals being considered are user fees on boats with revenues earmarked for improving the marine environment; an excise tax on all luxury goods, including boats; and the elimination of the mortgage interest deductions on boats that qualify as second homes. Such measures, if enacted, would lower projected growth in pleasure boat shipments by raising the relative price of boats and boat maintenance, and by decreasing growth of disposable income. The degree to which sales will be affected will depend on the cumulative size of the tax measures enacted.—*John A. Vanderwolf, Office of Consumer Goods, (202) 377-0348, September 1990.*

Additional References

(Call the Bureau of the Census at 301-763-4100 for information about now to order Census documents.)

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Boat and Motor Dealer, 3949 Oakton, Skokie IL 60076. Telephone: (312) 982-1810.

Boating, Diamandis Communications Inc., 1633 Broadway, New York, NY 10019. Telephone: (800) 525-0643.

Boating Industry, 850 Third Ave., New York, NY 10022. Telephone: (212) 715-2600.

Boating 1988, A Statistical Report on America's Top Family Sport, National Marine Manufacturers Association, 401 N. Michigan Ave., Chicago, IL 60611. Telephone: (312) 836-4747.

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Marine Industry, P.O. Box 2087-CVS, Thousand Oaks, CA 91360. Telephone: (805) 496-1979.

Soundings Trade-Only, Pratt St., Essex, CT 06426. Telephone: (203) 767-3200.

SPORTING AND ATHLETIC GOODS

The sporting and athletic equipment industry (SIC 3949) produces equipment for golf, fishing, tennis, physical fitness, gymnastics, archery, bowling, billiards, winter sports, and team sports. This category does not include camping equipment; athletic apparel and footwear; hunting equipment; and most leisure-related vehicles such as boats, bicycles, motorcycles, or snowmobiles.

Product shipments of sporting and athletic goods dropped an estimated 1.7 percent in constant dollars in 1990. Apparent consumption was up only slightly, an estimated 0.9 percent. U.S. imports rose an estimated 10 percent, increasing its share of the market vis-a-vis U.S. production. Despite the poor domestic performance, U.S. production was boosted by higher exports, which increased an estimated 23 percent. Employment in the industry grew during the first 5 months before dropping to an estimated average of 60,400 for the year.

Trends and Forecasts: Sporting and Athletic Goods, NEC (SIC 3949)

(in millions of dollars except as noted)

Item	1987	1988[1]	1989[2]	1990[2]	1991[3]	Percent Change 1987-88	1988-89	1989-90	1990-91
Industry Data									
Value of shipments[4]	5,120	5,747	6,006	6,119	—	12.2	4.5	1.9	—
Value of shipments (1987$)	5,120	5,574	5,613	5,493	5,326	8.9	0.7	2.1	−3.0
Total employment (000)	53.4	55.7	60.5	60.4	—	4.3	8.6	−0.2	—
Production workers (000)	39.7	41.7	44.2	44.0	—	5.0	6.0	−0.5	—
Average hourly earnings ($)	7.42	7.70	7.81	7.89	—	3.8	1.4	1.0	—
Capital expenditures	133	114	—	—	—	−14.3	—	—	—
Product Data									
Value of shipments[5]	4,349	4,825	5,116	5,221	—	12.3	4.8	2.1	—
Value of shipments (1987$)	4,349	4,667	4,768	4,687	4,553	8.6	1.0	−1.7	−2.9

[1] Advance data from the 1988 Annual Survey of Manufactures.

[2] Estimate.

[3] Forecast.

[4] Value of all products and services sold by establishments in the sporting and athletic goods, nec industry.

[5] Value of products classified in the sporting and athletic goods, nec industry produced by all industries.

SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA). Estimates and forecasts by ITA.

The decline of the sporting goods industry is primarily due to changes in consumer behavior. Real disposable income growth dropped from 4.9 percent in 1988 to 2.4 percent in 1989, and slowed even further, to 1.2 percent, during the first 6 months of 1990. Traditionally, discretionary items like sporting goods are the first purchases postponed during times of restraint. Conversely, when consumer spending is increasing, these purchases tend to grow faster than other purchases. For example, from 1986 to 1988, total real personal consumption expenditures grew at an annual rate of 3.2 percent while real personal consumption expenditures on selected leisure items (bicycles, motorcycles, toys, and sports equipment) grew at an annual rate of 4.6 percent. However, when income grew more slowly from 1988 through first 6 months of 1990, total real personal consumption expenditures increased annually by an estimated 1.3 percent, while expenditures on leisure items grew annually by only an estimated 0.5 percent.

Spending on sports equipment has declined as the national personal saving rate has increased. From 1986 to 1988, the annual growth of personal savings was 8 percent. From 1988 through 1990 the annual growth of personal savings increased an estimated 16 percent, reaching $196.3 billion. This increase was far greater than that of disposable income, which grew an estimated 6 percent during the same period. Therefore, the savings to disposable income rate jumped from 4.2 to 5.0 percent. As a result, the increase in the saving propensity lowered the level of discretionary income.

INTERNATIONAL COMPETITIVENESS

Imports surged in 1990, partly because of the stronger U.S. dollar in the latter part of 1989 and the first half of 1990. Many sporting goods items are produced primarily in Far Eastern countries with low labor costs and cannot be displaced by U.S. production. So, despite the weak dollar from 1986 to 1989, sporting goods imports continued to rise to meet U.S. consumer demand.

In 1989, Taiwan and South Korea were the two principal foreign suppliers, accounting for 52 percent of total U.S. sporting goods imports. Most products from these countries entered with well-established and respected U.S. brand names. U.S. manufacturers have taken advantage of low labor costs in Taiwan and South Korea to lower total production costs, since many sporting goods items are labor-intensive. However, the sources of imports have subtly changed. Higher labor costs, work stoppages, and the loss of the generalized system of preferences (GSP) benefits in Taiwan and South Korea have influenced major U.S. sporting goods companies to begin acquiring products from other less-developed countries. China, Mexico, and the Philippines have been the primary beneficiaries of this production shift, as the combined imports from these countries increased 100 percent in 1990. Combined imports from Taiwan and South Korea increased only 1 percent.

From 1986 to 1990, due to the depreciation of the dollar, U.S. sporting goods exports increased at an annual rate of 29 percent. The strengthening of the U.S. dollar versus other major currencies in 1989 may have slowed growth, as exports increased by only 15 percent for that year. However, in 1990 exports rose an estimated 26 percent, reaching an all-time high of $1.2 billion. U.S. sporting goods manufacturers are placing more emphasis on exporting as the U.S. market has declined slightly following strong growth in the 1980s. Since 1986, the exports to shipments ratio has grown 14 percent annually, and in 1990 exports accounted for 22 percent of domestic shipments.

The strong performance of U.S. exports is due in part to the growth of foreign sporting goods markets. The Japanese sports equipment market, the largest foreign market for U.S. exports, has experienced 6 percent real growth annually from 1986 to 1990, according to the U.S. Department of Commerce Foreign Commercial Service's *International Sector Analysis for Sports Equipment in Japan*. Leisure time in Japan has risen steadily during the last decade, allowing the Japanese to pursue more sports and leisure activities; golf products, for example, now account for over two-thirds of U.S. sporting goods exports to Japan.

Canada is the second largest foreign market for U.S. sports equipment, growing 91 percent to an estimated $148 million. Lower Canadian tariffs, as a result of the U.S.-Canadian Free Trade Agreement, have aided the growth of U.S. exports to Canada. Under the agreement, tariffs were eliminated in 1989 for certain sporting goods items, such as skis and other winter sports equipment. Canadian tariff rates on other sporting goods will be eliminated by 1998 in annual staged reductions from their current rates of 4.4 to 120 percent, which should provide U.S. companies with additional export opportunities. Other major foreign markets for U.S. sports equipment products are the United Kingdom, Mexico, and Germany.

Golf Equipment

In 1990, domestic shipments of golf equipment, the largest product category within domestic sporting goods, totaled an estimated $1.4 billion. Imports of golf equipment were up 10 percent to an estimated $307 million, while exports rose 18 percent to an estimated $515 million. Apparent consumption totaled $1.2 billion. The popularity of golfing continues to increase as the sport attracted 2.8 million new participants in 1989, according to the National Sporting Goods Association (NSGA). The sport has traditionally attracted higher-income consumers, but during the 1980s more middle- and lower-income consumers began participating, a trend that must continue that if golfing is to continue to grow.

Fishing Tackle and Equipment

In 1990, apparent consumption of fishing equipment was estimated at $640 million, down 1.8 percent from 1989. Current-dollar domestic product shipments were estimated at $471 million; such shipments declined 2.8 percent in constant dollars. Imports were estimated at $237 million, up only 1 percent, while exports increased an estimated 39 percent to $68 million. Imports, mostly from South Korea, Japan, and Taiwan, accounted for approximately 26 percent of apparent consumption. Despite the decline in sales of fishing tackle equipment, fishing remains the fourth most popular sports activity.

Exercise, Gymnastic, and Playground Equipment

An exceptionally fast growing subsector is exercise, gymnastic, and playground equipment; the NSGA estimated that retail sales of this equipment increased 19 percent in 1989 and 6 percent in 1990, reflecting sustained interest in fitness on the part of consumers. Apparent consumption of exercise, gymnastic, and playground equipment was estimated at $1.1 billion in 1990, with domestic shipments accounting for $837 million and imports for $298 million. Exports were estimated at $214 million, bringing total shipments by domestic producers to an estimated $1.1 billion. Manufacturers have developed new sophisticated products like air resistance bicycles, treadmills, and stair climbers that have attracted many new participants. The future of exercise equipment should remain strong in the coming years with physical fitness no longer a fad, but a lifestyle.

Table 4: Major Sporting Goods Industry Segments: Domestic Shipments and Trade

(in millions of dollars)

Industry and Item	1989[1]	1990[2]	Percent Change 1989-90
Fishing Tackle and Equipment			
Product Shipments	467	471	0.9
Product Shipments (1987$)	435	423	−2.9
Imports	234	237	1.1
Exports	49	68	39.4
Apparent Consumption[3]	652	640	−1.9
Golf Equipment			
Product Shipments	1,319	1,373	4.1
Product Shipments (1987$)	1,229	1,233	0.3
Imports	278	307	10.2
Exports	437	515	17.9
Apparent Consumption[3]	1,160	1,164	0.3
Playground, Gymnastic, and Exercise Equipment			
Product Shipments	976	1,070	9.6
Product Shipments (1987$)	910	961	5.6
Imports	325	298	−8.3
Exports	151	214	42.2
Apparent Consumption[3]	1,151	1,154	0.3

[1] Estimated Product Shipments.

[2] Estimated Trade and Product Shipments.

[3] Apparent Consumption = Product Shipments − Exports + Imports.

Source: U.S. Department of Commerce.

Other Sporting and Athletic Goods

This category includes all other sporting goods products like ski, water sports, and team sports equipment. One of the fastest growing sports in this sector is in-line roller skating, which, according to NSGA reports, attracted 5.2 million new participants in 1989. In 1990, a Minneapolis market research firm estimated that wholesale shipments of in-line roller skates would reach $53 million, an increase of nearly 200 percent over the previous year. Other major segments that have experienced growing participation rates include bowling, billiards, basketball, volleyball, and tennis.

Outlook for 1991

Apprehension about the overall economy should curb the growth of apparent consumption of sports equipment again in 1991 since these products tend to be discretionary purchases. As a result, constant-dollar product shipments are forecast to decline about 3 percent during 1991. The growth of imports should also slow to between 2 and 3 percent. Exports will continue to be robust, but slower growth is probable due to weaker foreign markets.

The overall economy may face a period of slow growth, according to administration forecasts. It is predicted that GNP will grow between 1 and 1.5 percent in 1991. Inflation may be as high as 4.5 percent in 1991. Apprehension about the economy will probably impel consumers to increase savings and lower their debt, leaving less discretionary income for purchases such as sporting goods equipment.

In addition, consumer prices for sports equipment are projected to rise in 1991. In 1989 and 1990, the producer price index for sporting goods grew an estimated 3.7 and 3.8 percent. In 1991, the producer price index will probably be more than 4 percent. Distributors and retail outlets are expected to pass much of these price increases on to the consumer, adding to the negative influence on apparent consumption.

Long-Term Prospects

The industry is expected to grow 3-4 percent annually over the next 5 years, given a healthier economy. Future sales of sporting goods are largely dependent on the continuation of the fitness boom that began in the late 1970s. Many individuals of the baby boom generation began activities like jogging, tennis, and biking as a way to improve their physiques. In the 1980s, the fitness boom continued, as individuals used exercising to relieve stress as well as improve health and fitness. As the 1990s begin, doctors have placed more emphasis on exercising as a way to prevent many diseases and ailments. With these forces in place, the fitness boom should continue.

One factor affecting the growth of fitness activities is the aging of the baby boom generation, which may result in a decreased participation in activities such as jogging, tennis, or other demanding sports. The growth of sports such as exercise walking, golf, and bowling suggests a continued desire for fitness, but at a slower pace. Exercise walking is the most popular sports activity of individuals over 55 years old, and bowling attracted more new participants than any other sport in 1989.

Another key to growth will be the development of new products. The goal for many athletes is to jump higher, throw farther, run faster, and compete at a higher level. Manufacturers must continue to improve products so participants achieve new skill levels. Such past developments as composite tennis rackets, golf clubs, and skis; aluminum baseball bats; and computerized exercise equipment have helped athletes improve their performance.—*John A. Vanderwolf, Office of Consumer Goods, (202) 377-0348, August 1990.*

Additional References

(Call the Bureau of the Census at 301-763-4100 for information about how to order Census documents.)

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Sporting Goods Dealer, Sporting News Publishing Co., 1212 N. Lindbergh Blvd., St. Louis, MO 63132. Telephone: (314) 997-7111.

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The Sporting Goods Market in 1990, National Sporting Goods Association, Mt. Prospect, IL 60056. Telephone: (708) 439-4000.

Sports Participation in 1989, National Sporting Goods Association, Mt. Prospect, IL 60056. Telephone: (708) 439-4000.

Sports Trend, Shore Communications Inc., Suite 300, N Building, 180 Allen Rd. NE, Atlanta, GA 30328. Telephone: (404) 252-8831.

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Retailing

Retailing sales in 1991 are expected to increase by 6 percent. Nondurable goods are forecast to account for 67 percent of total sales, and durable goods 33 percent.

This chapter includes establishments selling merchandise for personal or household consumption. Retail establishments are typically classified according to the principal kind of merchandise sold. Major retail segments and their share of total sales in 1989 were: apparel stores (SIC 56), 5.2 percent; eating and drinking places (SIC 5812, 5813), 9.6 percent; general merchandise stores (SIC 53), 11.3 percent; furniture group stores (SIC 57), 5.1 percent; food stores (SIC 54), 20.7 percent; and automotive establishments (SIC 5511), 22.0 percent. Between 1986 and 1989, per capita retail sales increased from $5,800 to $6,800.

In 1989, total retail sales increased by 5 percent to $1.7 trillion. Apparel and accessory stores had the largest gain (7.1 percent), followed by food stores (7 percent), furniture group stores (6.9 percent), general merchandise (5.4 percent), and eating and drinking places (4.5 percent). Sales of durable goods store rose by 3.2 percent, and nondurable goods stores by 6.2 percent. By contrast, florist shops experienced 2.5 percent lower sales and variety stores sales were 0.4 percent lower. Sales of group II stores (companies with 11 or more units) accounted for 37 percent of all sales in 1989, with a total of $638 billion.

Before reading this chapter, please see "How to Get the Most Out of This Book" on page one. It will clarify questions you may have concerning data collection procedures, factors affecting trade data, forecasting methodology, the use of constant dollars, the difference between industry and product data, sources and references, and the Standard Industrial Classification system (SIC). For other topics related to the subject of this chapter, see chapters 33 (Foods and Beverages), 34 (Apparel), and 38 (Household Consumer Durables).

Turmoil in Retailing

Campeau Corp's declaration of bankruptcy in January 1990 was the forerunner of the difficulties experienced by the entire retail industry, and the department store segment in particular.

Ames Department Stores also sought protection in 1990 under the bankruptcy laws as it attempted to integrate its acquisition of Zayre. Other significant events of 1990 were the sale of British American Tobacco retail interests in the United States, including Saks and Marshall Field, and other major store properties.

In spite of major changes in the retail environment, department stores are expected to remain a viable, growing segment of the general merchandise group in the 1990s and beyond. This is based on the industry's past ability to adapt to changing economic and social conditions, to attract and retain capable management, and to finance expansion.

Technology

The retail industry increased the installation of automated checkout equipment in 1989 and 1990. The information thus gathered is vital to corporate managers to control inventory, to track the sale of individual items, and to gauge the success of sales campaigns. The competitiveness of the retail industry will require additional investment in these systems. The introduction of electronic data interchange (EDI) systems to enhance computer-to-computer reordering continues. The benefits of this technology will continue to increase as more retailers and manufacturers become familiar with EDI and the competitive advantages it provides.

J.C. Penney Co. appears to be poised to reap the benefits from its investment in equipment that will enable it to conduct about 80 percent of its transactions with merchandise suppliers electronically. The company also plans to convert 40,000 cash registers to bar-code scanner use. In addition, Penney's satellite broadcast system is being ex-

Trends and Forecasts: Total Retail and Selected Retail Establishments (SIC 52–59)

(in billions of dollars except as noted)

Type of Retailer	1988	1989	1990[1]	1991[2]	Percent Change 1988-89	1989-90	1990-91
Total retail sales	1,629	1,711	1,813	1,923	5.0	6.0	6.0
Department stores (SIC 5311)	159	168	178	189	5.6	6.0	6.2
Eating and drinking places (SIC 5812-5813)	157	165	179	190	5.0	8.5	6.1
Apparel and accessory stores (SIC 56)	83	88	93	99	6.0	5.7	6.5
Employment all retailing (000)	19,298	19,575	NA	NA	1.4	NA	NA
Average hourly earnings (dollars)	6.13	6.54	NA	NA	6.7	NA	NA

[1] Estimate.

[2] Forecast.

NA = Not Available.

SOURCE: U.S. Department of Commerce: Bureau of the Census and International Trade Administration (ITA). Estimates and forecasts by ITA.

panded to cover the entire store network. This will enable the company to beam 200 programs of merchandise presentations and permit the exchange of information that would entail 11,000 hours of transmission.

Outlook for 1991

Retail sales are expected to increase 6 percent over 1990. Retailers expect lower interest rates in 1991, which would boost consumer spending and make it cheaper to finance new construction and to carry inventory.

Long-Term Prospects

The political change in Eastern Europe and the liberalization in the Soviet Union can have positive effects on the domestic retail economy. Import opportunities exist for selected categories of merchandise from countries where lower labor costs can be capitalized on to produce merchandise that is labor intensive and which stresses handwork, such as apparel and dolls. The attractiveness of direct investment via overseas stores will depend on a favorable investment climate, the potential for future sales, and freedom to repatriate earnings. As these nations return to a market economy with improved postal service and transportation, sales via mail-order may become practicable and profitable. For the foreseeable future, the domestic economy, aided by continued growth in disposable income and an upscale consumer bias, should enable the nation's retailers to continue to grow.

Department Stores

Between 1982 and 1987, the number of department stores with 25 or more employees increased from 10,163 to 11,069. In 1987, there were 10,041 department stores with 50 or more employees. Of the total, 2,425 were identified as conventional, 5,798 as discount or mass merchandising, and 1,818 as national chain stores.

The industry is continuing to consolidate, resulting in larger but fewer companies. Former regional companies, such as Dillard's and Wal-Mart, have become more national. Both companies have been highly successful in the past. Both have leadership, management, and the financing needed to realize planned expansion objectives.

INTERNATIONAL COMPETITIVENESS

Although department stores appear best suited to expand abroad, this may not happen anytime soon. The ability to purchase and finance land, buildings, and inventory; import restrictions; local building laws; the ability to remit profits; and exchange-rate risks are among the factors that companies must take into account when they contemplate foreign operations. Indeed, in recent years department stores have sold or disposed of foreign subsidiaries, and Sears, Roebuck & Co. terminated a large trading company after experiencing several years of huge losses.

As large importers of merchandise, department stores have a considerable stake in the outcome of the General Agreement on Tariffs and Trade (GATT) negotiations, which were expected to be concluded at the end of 1990. Imports of textiles and apparel are largely controlled by bilateral agreements with producer countries under the auspices of the Multi-Fiber Arrangement. Negotiators are working to bring GATT surveillance and discipline to textile and apparel trade upon expiration in 1991 of the Multi-Fiber Arrangement, a series of bilateral import-limiting agreements between the United States and nations that manufacture apparel.

Management Horizons

Despite major changes in the retail environment, department stores will remain a viable and growing segment of the general merchandise group.

Eating and Drinking Places

Sales of eating and drinking places increased by 4.5 percent in 1989, to $164.6 billion. Refreshment place (fast food) sales were $65.5 billion and accounted for 40 percent of the total. Sales of Group II eating places (companies with 11 or more units) were $42.2 billion, accounting for 26 percent of the total.

Between 1982 and 1987, the number of establishments increased from 352,000 to 391,000, aided by a 10 percent gain in the restaurant category and a 9 percent gain in refreshment place establishments.

With modest year-to-year overall sales increases, competition has become extremely keen, especially among the larger chains that feature hamburgers and chicken. Discount coupons and other price-reducing techniques are increasingly being used by companies of all sizes. Increasingly, too, the restaurant industry is offering the public a choice of healthier foods.

Several large American companies were recently sold, in some cases to foreign owners. Hardee's, a Canadian-owned firm, purchased the Roy Rogers chain from Marriott Corp. Restaurant Associates was purchased by the Kyotara Company, and the Red Robin chain was purchased by Japanese interests. The Japanese also own Denny's Japan Co., a 343-store chain, and the Japanese Mister Donut chain through a licensing arrangement. Burger King is owned by Britain's Grand Metropolitan PLC.

Apparel Stores

The number of apparel establishments increased from 41,000 to 148,000 between 1982 and 1987. The number of tores increased in all segments of the industry, with the xception of the men's and boys' clothing groups. Their umbers declined from 18,600 stores in 1982 to 16,500 in 987. The number of men's shoe stores also declined luring the same period, from 4,400 to 3,900.

Sales of apparel stores increased 7.1 percent in 1989 over 988. Shoe stores gained 8.5 percent and family clothing tores gained 8.2 percent. Women's clothing specialty tores and furriers had a gain of 4.9 percent, and men's and oys' clothing showed an increase of 0.5 percent.

NTERNATIONAL COMPETITIVENESS

Domestic apparel retailers will be affected by the current GATT negotiations directed at supplanting the Multi-Fiber Arrangement, discussed earlier.

Sales of American apparel to the Japanese market continue o increase. Retailers and apparel manufacturers include Levi trauss & Co., Polo Ralph Lauren, Barney's, Brooks Brothrs, and Paul Stuart. Overseas sales are being made via stores wned by American retailers or manufacturers, either directly r with Japanese partners. Sales are also made under licensng arrangements with overseas manufacturers or by direct mport by Japanese companies.

urniture

Furniture store sales totaled $28.3 billion in 1989, an ncrease of 1.4 percent over 1988. In 1987 there were 32,763 tores selling furniture. Of the total, 6,663 were individual roprietorships, 1,412 partnerships, and 24,685 corporaons. In 1982, by comparison, there were 31,642 furniture tores.

Furniture retailers are discovering new sales opportunies overseas. In Japan, Drexel Heritage Furnishings Co. is elling furniture in concert with the Daimaru, Inc. store hain. The furniture industry is negotiating with the Euroean Community (EC) to arrive at standards for flammaility, fire retardation, and other consumer safety requireents. EC is a potentially huge market of 325 million eople with a Gross Domestic Product of $4.5 trillion and per capita income of $13,770 in 1988.

Domestically, the industry continues to expand via acuisition of existing furniture chains as well as previously lanned expansion strategies. An example of the latter is e 1990 Helig-Meyers purchase of 34 stores, creating a tal of 315 retail stores.

The aging baby boom generation is now stressing quality furniture rather than price. Merchandise at the low end ntinues to sell well, however, in part because of improved uality.

Retail chains continue to mail out catalogs as an adjunct store sales. Catalogs tend to interest consumers and draw em into stores.

rug Stores

Drug store sales totaled $62.6 billion in 1989, 6.6 percent gher than in 1988. For the first 5 months of 1990, drug ore sales were 7.9 percent above the same period a year o. In 1987 there were 52,181 drug and proprietary stores, compared with 51,739 in 1982. (A proprietary store sells the same merchandise as a drug store but does not sell drugs or fill prescriptions.) There were 2,611 proprietary stores in 1987, compared with 3,034 in 1982. In 1987 there were 8,338 single proprietors, 1,580 partnerships, and 42,265 corporations.

According to *Drug Store News*, the number of multi-unit companies declined by 36 percent between 1979 and 1989, while the number of stores increased by 17.5 percent. In 1989, 14 companies had sales of $1 billion or more, with the largest drug store retailer selling $5.4 billion that year.

The drug store industry continues to face significant competition from other non-drug store competitors. *Drug Store News* determined that in 1989, 40 supermarket chains owned 3,001 stores with pharmacies and a group of 8 mass merchandisers had 2,102 stores with pharmacies. Other competitors are general merchandise retailers, including department and variety stores.

Drug store managements are responding to increased competition by selling businesses not directly related to the pharmacy industry; refurbishing and upgrading existing profitable locations; accepting national credit cards; and expanding into areas with lower population densities. To maintain in-stock positions, warehouses and distribution centers are being added, and existing distribution centers are being upgraded with equipment that moves merchandise into and out of storage at a rapid pace.

A primary objective of management is to maximize automation equipment and to integrate all phases of buying, transporting, and managing inventories. The aim is to reduce paperwork and labor-intensive price marking on the sales floor. Increased use of point-of-sale scanning is expected to provide on-line monitoring of sales and to generate daily and seasonal buying patterns.

Variety Stores

Sales of variety stores declined 0.4 percent in 1989 to $8.1 billion. Between 1982 and 1987, the number of establishments dropped from 11,703 to 10,424.

In recent years the industry has faced diverse obstacles, including competition from drug and discount stores and supermarkets, and the loss of retail leases in central business districts.

The industry today is in an improved competitive position, aided by on-line point-of-sales systems, improved management, and a more clearly defined customer base.—*Marvin J. Margulies, Office of Service Industries, (202) 377-5086, September 1990.*

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Trends and Forecasts: Food Retailing (SIC 54)

(in millions of dollars except as noted)

Item	1987	1988	1989	1990[1]	1991[2]	Percent Change 1987-88	1988-89	1989-90	1990-
Retail Sales									
All food stores	314,287	331,892	355,028	380,747	410,022	5.6	7.0	7.2	7.7
All chain food stores	175,286	186,175	198,498	211,805	227,275	6.2	6.6	6.7	7.4
Grocery stores	296,106	310,724	332,962	357,601	385,852	4.9	7.2	7.4	7.9
Chain grocery stores	172,061	183,930	195,521	209,012	224,688	6.9	6.3	6.9	7.5
Meat fish (seafood) stores	5,678	6,892	7,157	7,572	7,875	21.3	3.9	5.8	4.0
Retail bakeries	5,049	4,845	4,837	4,847	4,850	−4.0	−0.2	0.2	nc
All other food stores	7,455	9,431	10,072	10,727	11,445	26.5	6.8	6.5	6.7
Employment and Earnings									
Total employment (00)	2,971	3,089	3,206	3,315	3,400	4.0	3.8	3.4	2.6
Non supervisory employment (00)	2,742	2,841	2,934	3,022	3,098	3.6	3.3	3.0	2.5
Average hourly earnings ($)	6.99	7.00	7.14	7.26	—	0.1	2.0	1.7	—

[1] Estimate.

[2] Forecast.

SOURCE: U.S. Department of Commerce: Bureau of the Census, International Tra Administration.

FOOD RETAILING

The food retailing industry (SIC 54) encompasses a variety of establishments that sell fresh, prepared, and packaged foods and beverages for at-home preparation and consumption. The majority of food retailers also sell a wide selection of such non-food items as paper goods, household cleaners, tobacco products, and pet foods. Many retailers also carry some general merchandise, alcoholic beverages, reading materials, and other sundries. A substantial number of larger establishments offer complementary and related products and services, including bakeries, delicatessens, pharmacies, fresh flower departments, and restaurants. Industry sales volume for food retailing includes all goods and services sold by the establishments.

The industry includes independently owned stores and corporations that own and operate chains of supermarkets, convenience stores, candy and nut shops, meat-poultry-seafood stores, produce stores, retail bakeries, and miscellaneous food retailers, including so-called health food stores. The large chain stores usually receive the majority of their inventory from a wholesale distribution facility owned and operated by the same corporate entity. Independently owned and operated establishments usually buy their inventory from independent wholesaling operations. Such retailers are often associated with voluntary or cooperative wholesaling groups or franchise groups. Sales by restaurants within food retailing establishments are not considered part of food retailing unless they are owned by the food retailer.

In 1990, total sales and services of the food retailing industry increased an estimated 7.2 percent, to about $381 billion. Sales by grocery stores, including convenienc stores, reached $358 billion, an estimated 7.4 percent gai over 1989. Sales of the chain store segment of the grocer store group rose about 6.9 percent, to $209 billion. Sales c meat and seafood specialty store rose almost 6 percent, t $7.6 billion. Sales of retail bakeries turned up by 0. percent after declining in 1989 and 1988.

Overall, chain stores accounted for about 56 percent c the industry's total sales, and about 58 percent of tota grocery store sales.

Consumer Expenditures

Demographic shifts and changing lifestyles have contrib uted to a pronounced change in the way consumers allocat their spending for food and beverages. Progressively mor of the total food and beverage dollar is devoted to foo consumed away from home, that is, meals and drinks pu chased in restaurants, hotels, schools, and other food servic establishments. During the first six months of 1990, consum ers allocated 32.4 percent of their food and beverage dollar t the food service sector. In 1986, food service spending repre sented only 30.9 percent of consumers' food dollar.

As a proportion of personal consumption expenditure (PCE), the amount spent on eating at home has als declined. In the first six months of 1990, PCE for all foo and beverages consumed at home represented 11.4 percen of total PCE. By comparison, at-home food and beverag PCE accounted for 11.5 percent of total PCE in 1989, an 12.2 percent in 1986.

In recent years, food retailers have attempted to compet with the growing food service sector by adding and enhanc

Table 1: Personal Consumption Expenditures Food, Non-Alcoholic and Alcoholic Beverages

(millions of dollars)

	Annual			January-June Annualized Rate		
	1988	1989	Change(%)	1989	1990	Change(%
Total: all food and beverage	562,629	595,266	5.8	590,656	617,468	4.5
Food and beverage: at-home	372,182	395,363	6.2	391,625	409,599	4.6
Food, non-alcohol beverage	334,055	355,738	6.5	352,202	368,859	4.7
Alcoholic beverage	38,127	39,625	3.9	39,423	40,740	3.3
Food and beverage: away-from-Home	179,911	188,796	4.9	188,090	196,159	4.3
Food, non-alcohol beverages	154,885	162,906	5.2	162,061	170,086	4.9
Alcoholic beverages	25,026	25,800	3.1	26,028	26,073	0.2
Food/beverage furnished employees	9,748	10,469	7.4	10,274	11,084	7.9
Supplied civilian	9,213	9,915	7.6	9,725	10,523	8.2
Supplied military	535	554	3.6	549	561	2.2
Food produced/consumed on farm	788	640	−18.8	669	627	−6.3

SOURCE: U.S. Department of Commerce, Bureau of Economic Analysis.

ing service delicatessens, in-store bakeries, and meat and seafood departments. Food processors, also affected by a loss of market share to food service establishments, have responded by expanding frozen and shelf-stable prepared food selections and, less successfully, with fully prepared refrigerated entrees and salads. Many of the processed frozen and shelf-stable products designed for microwave preparation have been a disappointment, thus failing to help stem the trend to away-from-home preparation. Many industry analysts contend that the trend to more spending on food away from home is likely to continue for some time. As a result, food retailers and food processors will be pressed to devise new strategies to minimize further erosion of the market.

Food Prices

In late August, the U.S. Department of Agriculture (USDA) revised its consumer food cost estimates for 1990. For the overall food at-home cost, the revised estimate of 7 percent for the year exceeded the midyear estimate of 4 percent to 6 percent. The U.S. Bureau of Labor Statistics (BLS) index of at-home food prices increased 6 percent in June compared with June 1989. At midyear, consumer prices for cereals, bakery goods, red meat, and dairy products had risen by more than 6 percent over 1989. Seafood, sugar and sweet goods, and other prepared foods rose somewhat less than 6 percent.

In response to rising food costs, more and more consumers are switching to less expensive brands and also away from costly convenience foods.

Management Horizons

To counter the growing trend of eating away from home, food retailers are adding and enhancing delicatessens, bakeries, and meat and seafood departments.

Food Labeling

In late October 1990, Congress approved legislation revising and refining health claim and nutritional labeling regulations for food products. The new legislation, which sets a single, uniform national labeling standard, will take effect six months after the U.S. Food and Drug Administration (FDA) completes writing its implementing regulations.

The legislation requires the FDA to create a relatively brief list of health claims available to food manufacturers; these allowed claims must be substantiated by accepted scientific evidence. All other health-related claims will be disallowed. In addition, the legislation requires the addition of several new nutritional information items—such as the amounts of fiber, cholesterol, saturated fats, and the number of calories from fat. Heretofore, many manufacturers provided this sort of information voluntarily. Special rules will apply to labeling for fresh fruits and vegetables and for foods in restaurants.

Consumer confusion about food product health claims and nutritional information had increased recently as more manufacturers added unregulated information to their labels. Industry analysts estimated that upwards of 40 percent of new product labels contained health claims of some sort. The new legislation sets a consistent national standard that will preclude the states from making their own rules, which would have added to manufacturers' costs and created possible further confusion. In its final form, the new legislation had the support of consumer-interest groups and the food processing industry. Imported processed and fresh foods will be required to provide the same health and nutrition information.

Outlook for 1991

Food retailing industry sales are forecast to rise by almost 8 percent, to $410 billion. Grocery store sales are expected to increase about 7.9 percent, while sales of other types of food retail establishments are forecast to grow more slowly than in recent years. However, real industry growth is not expected to rise beyond 1990 levels because of general price increases and a move by some consumers to selectively substitute less costly grocery items and beverages for higher-priced convenience products. Consumers are expected to exhibit renewed interest in private label and generic brand grocery items.

Long-Term Prospects

Adjusted for inflation, industry sales are forecast to rise by about 1 percent annually over the next five years. Spending for food and beverage consumption at home is likely to stabilize or even increase as a share of total personal consumption expenditures. Spending for food and drink outside the home will decrease proportionately. Consumers and retailers are expected to express renewed interest in generic products and private label goods. Brand-name food manufacturers will likely compete more aggressively for market share.—*Cornelius F. Kenney, Office of Consumer Goods, (202)-377-2428, October 1990.*

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Transportation Services

Prospects for these industries depend heavily on the course of the economy. Stiffer competition and higher fuel prices promise a period of turbulence for the air transport industry. The trucking industry remains the largest segment of the total U.S. freight transport market. Growing competition within the industry and with other transport modes is keeping pressure on rates, and hence on revenue growth. Rail traffic volume is expected to be relatively flat, but Amtrak passenger miles should grow 3 percent. Slower economic growth and a weaker dollar will restrain the growth of U.S. liner import cargoes.

AIRLINES

The U.S. commercial airline industry (SIC 451 and 452) consists of approximately 230 carriers providing scheduled, charter, and on-demand transportation services for passengers and cargo. Of these firms, 72 primary carriers operate fleets of aircraft with more than 60 seats, a maximum payload of more than 18,000 lb., or conduct international operations and provide the vast majority of all U.S. service (Table 1).

Air travel increased significantly in the first half of 1990. Major carriers increased revenue passenger miles 7.9 percent in the first half, compared with the same period in 1989. Load factors declined, however, as available seat miles increased 8.5 percent. Total passenger enplanements for the industry declined 0.2 percent. However, the average trip was longer, with substantial increases in international travel.

After having risen more than 20 cents per gallon above summer 1989 prices, fuel costs declined during the first seven months of 1990 to approximately the level of a year earlier. Prices peaked in January 1990, reaching 78 cents a gallon. High fuel prices in early 1990 hurt airline earnings, as they had in the latter part of 1989.

Quoted air fares increased 11.4 percent between July 1989 and July 1990, but much of this increase was dissipated by substantial fare discounting. Operating revenues for majors and nationals increased $2.7 billion during the first half of 1990 over the same six months of 1989, but operating expenses increased almost $4 billion for the period. As a result, operating profits decreased from $1.3 billion to only $24 million and produced a net loss of $ 147 million. The second quarter, however, showed improvement over the first quarter with net profits of $458 million as opposed to net losses of more than $600 million the previous year. The second half of 1990 brought substantial uncertainty, with jet fuel prices doubling during the Gulf crisis. The airlines have found it necessary to raise fares to meet these costs, thus discouraging air travel. At the same time, however, the carriers have found it difficult to maintain the fare increases, especially for discretionary travel during a generally slowing economy. The industry could see net losses well above $1 billion for the year.

Regulations that controlled virtually every economic facet of U.S. commercial aviation were eliminated in 1977-78, and the reverberations continue to be felt both here and abroad. In the first years following deregulation, the industry expanded rapidly, not only in capacity and frequency of flights, but also in the number of firms offering service. Today, overall system capacity remains high, but the number of primary and secondary carriers has declined. Passenger service to many smaller communities is being curtailed and fares have gone up. Many airlines have ceased operations altogether; many others have merged. Marketing alliances are being formed among domestic carriers and with foreign airlines, and new routes and services are constantly being created. While merger activity abated during 1989-90, outside pressure has developed from entities interested in acquiring control of several of the now asset-rich major carriers.

As a further consequence of deregulation, the basic concepts that define aviation relations between the United States and many other countries are shifting, perhaps moving ever more closely to "open skies" free market competition. Discussions between the United States and Canada are to begin in 1991 to open the two countries' air transport markets and provide increased cross-border flights. This would bring benefits to the tourism industry as well as to business and pleasure travelers. Similar discussions have begun between the United States and the European Community, whose 12 member nations are moving toward integrating their economies in 1992.

The "Unserved Cities Program" that permits the airline of a bilateral aviation partner to provide service from its

Trends and Forecasts: Airlines (SIC 451, 452)

(in millions of dollars except as noted)

Item	1988	1989	1990[1]	Percent Change 1988-89	Percent Change 1989-90
Total operating revenues (billions $)	64.5	71.6	77.0	11.0	7.5
Revenue passenger miles (billions)	437.6	447.4	481.8	2.2	7.7
Freight revenue ton miles (billions)	14.6	16.3	18.3	11.6	12.3
Employment (000)[2]	540	576	644	6.7	11.8

[1] Estimate.

[2] Data for SIC 451 only, data for 452 not available.

SOURCE: U.S. Department of Commerce, International Trade Administration (ITA); U.S. Department of Transportation, Federal Aviation Administration; U.S. Department of Labor, Bureau of Labor Statistics. Estimates by ITA.

home country to a U.S. city that does not have international service between the two points has brought international service to previously unserved routes without the need to renegotiate bilateral aviation agreements.

The air transport industry had an operating profit (revenues on flight operations less direct operating expenses) on domestic and international flights of $1.9 billion in 1989, a decline of $1.6 billion from 1988. Operating expenses rose $8.7 billion to $69.7 billion, a 14.3 percent increase, while operating revenues increased $7.1 billion to $71.6 billion. Contributing on the passenger side to the industry's increased revenue was a 2.2 percent increase in revenue passenger miles (RPMs, a measure equivalent to carrying one paying passenger one mile) to a total of 447.4 billion. Freight ton miles (a measure of cargo carriage equal to one ton carried one mile) increased 11.6 percent to a total of 16.3 billion, as total freight revenues increased 17.2 percent to almost $16 billion, improving yield per ton mile.

The four largest passenger carriers, American, United, Delta, and Northwest, along with Federal Express—the largest cargo carrier—generated operating profits of $2.59 billion, more than the industry total. American contributed $731 million, down 8.7 percent from last year; United $457 million (down 27 percent); Delta $676 million (up 29 percent); Northwest $290 million (up 48 percent); and Federal Express $434 million, a decrease of $134 million (24 percent). The latter figures represent the combined operating profit of Federal Express and Flying Tigers, which Federal Express acquired last year. The industry's operating profits were partially offset by losses of other carriers. Eastern absorbed an $865 million loss in 1989 (up 314 percent), Pan Am had a deficit of $319 million (up 204 percent), and U.S. Air, which had an operating profit of $427 million in 1988 (the combined operating profits of U.S. Air, $283 million, and Piedmont, $144 million) lost $228 million in 1989.

According to FAA data, the industry's net profits (operating profits less taxes and debt service) totaled $440 million in 1989, down $1.25 billion from $1.7 billion in 1988. Although Delta's operating profit was some $54 million lower than that of industry leader American, it enjoyed the industry's largest net profit last year—$473 million. American reported a net profit of $423 million, United $358 million, Delta $473 million, and Federal Express $125 million. These five carriers plus Continental and newcomers Southwest and America West were the major carriers that generated both operating and net profits in 1989. TWA produced a small operating profit of $24 million but a net loss of $299 million. Continental, which had a net loss of $316 million in 1988, moved to the profitable side in 1989 with a $3 million net profit. Southwest increased its operating profit 14 percent, from $86 million in 1988 to $98 million in 1989, and improved its net profit almost 25 percent, from $57 million to $71 million. America West saw its operating profit grow from $18 million to $48 million, and net profit more than double from $9 million to $20 million. The top two net earners, Delta and American, accounted for half of the net profits generated by the seven profitable majors. Eastern, with net losses of $852 million, accounted for half the net losses of the four majors. The other majors with net losses were Pan Am ($415 million), TWA ($299 million), and U.S. Air ($138 million).

Table 1: 1990 Primary U.S. Air Transportation System Commercial Carriers Operating Aircraft With 60 or More Seats or a Maximum Payload Capacity of More Than 18,000 lb.

Majors, Annual Revenues Above $ 1 Billion	America West, American, Continental, Delta, Eastern, Federal Express, Northwest, Pan American, Southwest, Trans World, United, USAir
Nationals, Annual Revenues From $100 Million to $999 Million	Air Wisconsin, Alaska, Aloha, American Trans Air, Braniff, Evergreen, Hawaiian, Horizon Air, Markair, Midway, Pacific Southwest, Southern Air, Tower, Trump Shuttle, United Parcel Service, West Air, World
Large Regionals, Annual Revenues From $10 Million to $99 Million	Air America, Amerijet, Arrow, Aspen, Challenge Air Cargo, Connie Kalitta, Emerald, Express One, Five Star, Florida Express, Florida West, Gulf Air Transport, International Air Service, InterState, Key, MGM Grand, Midwest Express, Northern Air, Orion, Presidential, Reeve, Rich, Rosenbalm, Skyworld, Sun Country, Sunworld, Trans Continental, Trans International, Zantop
Medium Regionals, Annual Revenues Under $10 Million	Aerial, Aeron, Air Transport International, Buffalo, Casino Express, Conner, Emery, Great American, Independent Air, Jet Fleet, Million, North American, Pacific Interstate, Trans-Air-Link

SOURCE: FAA

Passenger Service

U.S. major passenger carriers posted a combined operating profit for the first half of 1990, but just barely. The 11 major passenger carriers had a combined first-half operating profit of just under $70 million. For the first-half of 1989 combined operating profit was $1.2 billion. The 11 majors posted a first-half 1990 net loss of just over $66 million, compared with a net profit of $416 million for the first six months of last year. The operating profit of the majors declined because their higher operating revenues were outstripped by increased operating expenses. Thus, although operating revenues increased 8 percent, from $28.7 billion to $31 billion, operating expenses jumped 12 percent, from $27.5 billion to $30.9 billion.

The four carriers with large net losses in 1989 continued to have substantial net losses in the first half of 1990: Eastern ($172 million), Pan Am ($240 million), TWA ($40 million) and U.S. Air ($113 million) U.S. Air, which had a $116 million net profit in the first half of 1989 (but a loss for the full year) had the greatest decline, $229 million, for a net loss of $113 million. The seven major carriers with net profits continued to show positive numbers, but only Continental had an increase in net profits for the first six months of 1990 ($118 million) over the first half of 1989 ($16 million). Net profits of the remaining six carriers declined $535 million in the first half of 1990, from $916 million in the first half of 1989 to $381 million.

Revenue passenger miles flown on international and domestic routes by all scheduled carriers increased 2.2 percent during 1989, to a total of 433 billion. Through the first eight months of 1990. RPMs for the 11 majors totaled 300.4 billion, an increase of 21.4 billion, or 7.7 percent, over the corresponding eight-month period in 1989.

As a result of the expansion of the airline industry's capacity to transport passengers in the years following deregulation, most carriers struggled to fill their aircraft. They often resorted to massive discounting to attract new customers, regardless of the consequences. For many, the outcome was bankruptcy and failure.

The major passenger carriers have increased their passenger enplanements to the point where load factors (a ratio of RPMs to seat miles available for occupancy, or ASMs, that reflects how many of the available seats were actually producing revenue), reached 62.9 percent in calendar 1988 and 63.5 percent in 1989. In the first eight months of 1989, the load factor was 64.7 percent. By the end of August 1990, the majors had a total of 469.2 billion seat miles available on the market during the 8-month period, an increase of 8.7 percent over the previous span. Load factors declined to 64.0 percent. This, along with increasing costs put pressure on airlines profits. Load factors are normally lower in the fall, except during the year-end holidays.

Cargo Service

Revenues from cargo service are relatively small compared with revenues generated by passenger service, but they are increasing rapidly. The industry generated total cargo operating revenues of $8.9 billion in 1989, an increase of $1.4 billion, or 18.5 percent. Freight revenue ton miles increased 6.7 percent to 10.3 billion. One air freight carrier, Federal Express, earned $5.8 billion—almost two-thirds of the industry total—carrying 40.4 percent of the freight ton miles (FTMs). The 11 major passenger carriers moved 5.8 billion FTMs, or 56 percent of the total, and in 1990 increased their market by 1.1 percent. The gain was at the expense of Federal Express, whose market share declined 1.3 percent.

New programs being implemented by some of the combination carriers to strengthen their presence in the market appear to be having an effect. Among the passenger airlines, the top four cargo carriers in 1989 were American, Pan Am, United, and Northwest. All four increased their FTMs, with a combined growth of 416 million revenue freight ton miles to 4 billion FTMs, an 11.5 percent increase over 1988.

INTERNATIONAL COMPETITIVENESS

The decline in the value of the dollar has made the United States a bargain for foreign tourists. The airline industry is profiting from this situation. Interest remains strong among both U.S. passenger and cargo carriers to expand service abroad, so much so that some carriers have begun to argue for a relaxation of the bilateral agreements between national governments that establish—and frequently artificially restrain—the terms under which airlines are allowed to serve international routes.

A strong increase in international RPMs (up 9.3 percent in 1989) contributed almost all the gain in the year's overall RPM increase. Domestic RPMs rose only 0.2 percent. International enplanements increased 5.5 percent in 1989, to 37.4 million. Through the first eight months of 1990, the scheduled airline industry's international traffic rose 16.9 percent to 79.6 billion RPMs from 68.1 billion RPMs, while capacity increased 11 percent to 111.7 billion ASMs from 100.9 billion ASMs for the corresponding eight months in 1989. The international load factor was 71.2, up from 67.5 during the first eight months of 1989. The number of passengers enplaned in international service increased 13.4 percent, from 24.8 million to 28.2 million.

Measured on a fiscal-year basis ending September 30, 1990, available seat miles, revenue passenger miles, load factors, and enplanements rose for air travel to all regions of the world. Growth on Pacific routes was phenomenal, with ASMs, RPMs, and enplanements all growing more than 20 percent and the load factor increasing to 71.9. On Atlantic routes the enplanements grew 7.2 percent to 16.1 million, and RPMs increased 8.9 percent to 53.5 billion. The load factor jumped 4 points to 69.7, since ASMs only increased 2.7 percent. On routes to Latin America, enplanements grew 9.5 percent to 12.9 million. Passengers travelled 15.9 billion RPMs on the 25.6 billion ASM, both increases of approximately 8 percent. The load factor rose 0.2 to 62.1.

Revenues earned by U.S. carriers for transporting foreign nationals are reported as U.S. receipts (i.e., exports) for determining the U.S. balance of payments, while revenues paid to foreign airlines by U.S. passengers are treated as U.S. payments (imports). Within this parameter, the U.S. Travel and Tourism Administration and the Bureau of Economic Analysis, both agencies of the Commerce Department, have formulated a survey method for estimating these transactions. Based upon this methodology, U.S. receipts for 1984-88 increased from $4 billion to $8.8 billion. Payments grew from $5.6 billion to $7.6 billion. For 1989 receipts rose another $1.3 billion to $10.1 billion, while payments rose only $600 million to $8.2 billion. Negative balances in the period 1984-86 have turned positive, increasing to a surplus of $1.9 billion in 1989.

Outlook for 1991

Several major factors make it difficult to project the flight path of the industry through 1991 or where it will be by the end of the year. These include the situation in the Middle East, with its effect on aviation fuel; the extent of the general slowdown that is developing in the economy; and the ability of air carriers to raise fares to meet increasing costs.

As the second largest industrial user of petroleum products after trucking, the airline industry's fortunes rise and fall with oil prices. Because airlines are also particularly vulnerable to recession, the industry can be doubly hurt if rising energy prices also lead to a general economic slowdown.

An increase of one cent per gallon for aviation fuel costs U.S. airlines an extra $160 million on an annual basis. During the period prior to the Iraqi invasion, airlines had been paying less than 60 cents per gallon. By the fall of 1990, carriers were paying as much as $1.20 per gallon and were regularly paying in excess of $1.00. If prices were to remain at approximately $1.00, 40 cents above the pre-August 2 price, U.S. air carriers would pay an additional $6.4 billion per year for fuel. This is almost double the airlines' operating profit in 1988, and more than triple the operating profit in 1989. It is also 15 times 1989's net income, and equal to about 9 percent of the year's total operating revenues.

Such a cost increase would be difficult for airlines to absorb in the best of times, but if the economy slows it will be even more difficult. Increases in air fares have been difficult to put in place. Even when fare increases have been published, substantial discounting has occurred as carriers try to gain market share or seek to increase cash flow. Higher prices for tickets also discourage travel, especially leisure travel, when the economy is weak. This will increase pressure on carriers to discount tickets.

If the Middle East crisis is resolved—leading fuel prices to fall to the lower levels prevailing in the spring of 1990—and the economy remains relatively firm, the airline industry could see a breakeven or better year if some of the fare increases put in place hold firm. If the increases do not hold, the industry could suffer net losses, although the stronger carriers would remain profitable.

Higher oil prices and a weakening economy may lead to a shakeout of the airline industry, sending weaker carriers into bankruptcy or into the arms of stronger carriers. Eastern is already under the protection of the bankruptcy court as it tries to work its way out of financial troubles. To raise operating funds, Eastern has already sold its Latin American routes and its shuttle service. Other carriers also are raising cash by selling off valuable assets. Pan Am has sold its Inter-German Service to Lufthansa and has announced its intention to sell its routes between five U.S. cities and London to United, a year after selling its Chicago to London routes. Midway sold 14 takeoff and landing slots at National and LaGuardia and its Philadelphia hub operation.

With the dollar remaining stable or declining slightly, the international travel market remains bright, with continued growth in travel to the U.S., especially from Europe and Japan. The international freight market should continue to grow as American goods remain attractively priced to foreign buyers.

Long-Term Prospects

The nation's general economic trend usually serves as a good yardstick for the airline industry, whose profits and losses closely track periods of growth and recession.

The U.S commercial aviation industry has now entered a new phase of the deregulation process—globalization. This, combined with other free market movements around the world, could lead to creation of multinational megacarriers. The race is now on among the world's carriers to see which of them can put together the most effective global system. The strategies include marketing agreements, code sharing, and/or equity stakes in other carriers.

Commercial carriers can be expected to continue to expand their present hub systems and to develop new secondary hubs at medium and small airports.

Despite somewhat slower growth and lower profits during the next year or two the airline industry is expected to resume its growth into the next century. Along the way, there will be some periods of relatively rapid expansion and profitability and other periods that are slower.—*C. William Johnson, Office of Service Industries, (202) 377-5071, October 1990.*

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TRUCKING

The trucking industry can be differentiated in numerous ways: for-hire carriage vs. private carriage, regulated vs. unregulated, interstate vs. intrastate, etc. There are also distinctions within these subsectors, such as ICC-regulated, or truckload (TL) and less-than-truckload (LTL). This chapter focuses on the entire industry as well as on selected subsectors.

For-hire trucking may be further distinguished by TL, LTL, small package, and package express markets. These markets denote four broad arenas in which trucking firms compete with each other, as well as with railroads, barges, and airlines. TL traffic constitutes the largest motor carrier market. A TL shipment is typically hauled directly from sender to receiver, without going through sorting terminals. The freight ranges from finished goods to raw materials. Depending upon the commodity, railroads, barges, and combinations of truck-rail, truck-barge, and rail-barge also compete for TL freight.

Small package includes the 2- to 3-day delivery market long defined by and dominated by United Parcel Service (UPS). The next-day delivery market, sometimes referred to as "package express," is dominated by air freight carriers such as Federal Express. However, truck service is a crucial element of the package express business, and both small package and package express markets are now fiercely contested by firms traditionally viewed as trucking companies. An example is UPS's rapidly growing overnight air division.

The Interstate Commerce Commission (ICC) defines the LTL market as shipments under 10,000 lb. The average shipment weighs about 900 lb. and typically involves five separate activities: local pick-up; sorting at a terminal facility; line haul; sorting at a destination terminal; and local delivery. Operationally, the LTL market resembles the package markets: with use of regional or national networks, sophisticated sorting terminals, and local pick-up and delivery service. A key difference is that package carriers pick up and deliver using drivers with hand trucks or metal dollies, instead of using trucks that are backed up to loading docks. Many LTL carriers historically handled packages merely as a variant of their smaller LTL business, but much of this traffic is now captured by the specialized package carriers.

In terms of revenue, the trucking industry easily remained the largest segment of the total U.S. freight trans-

Trends and Forecasts: Trucking, Local and Long Distance (SIC 421,423)

(in millions of dollars except as noted)

Item	1988[1]	1989[1]	1990[2]	1991[3]	Percent Change 1988-89	Percent Change 1989-90	Percent Change 1990-91
Revenue (billions of current $)	239.5	259.4	276.3	287.9	8.3	6.5	4.2
Cargo, intercity (billions of ton-miles)	704.0	751.2	777.5	794.6	6.7	3.5	2.2
Employment[4](000)	1,562.6	1,624.2	1,677.7	1,729.7	3.9	3.3	3.1
Average hourly earnings ($)	10.90	11.32	11.65	11.98	3.9	2.9	2.8

[1] Revised.
[2] Estimate.
[3] Forecast.
[4] Excludes owner operators and private carriage.

SOURCES: Eno Foundation; U.S. Department of Labor, Bureau of Labor Statistics (BLS). Estimates and forecasts by Interstate Commerce Commission.

port market in 1990. Reflecting trucking's higher revenues per ton and per ton-mile than either barge or rail movements, the trucking industry's ton and ton-miles make up a smaller share of U.S. domestic freight market (Table 2).

Table 2: Trucking Share of Freight Industry

(billions)

Item	Trucking	Total Freight Industry	Trucking Percent
Revenues	$276	$360	77
Tons	2.6	6.1	40
Ton-miles	704	2,793	25

Note: Revenue figures are 1990 estimates; ton and ton-mile data are for 1988.
SOURCES: Eno Foundation; estimates by Interstate Commerce Commission.

Besides pressure from other modes, the trucking industry itself is intensely competitive, with existing firms expanding and new ones entering the industry. Entry and resulting competition among ICC-regulated carriers is particularly noticeable under the deregulatory impetus of the Motor Carrier Act of 1980. ICC operating authority for companies with annual revenues under $1 million grew from 14,610 in 1980 to 40,384 in 1989, an increase of 275 percent. This figure had increased by another 1,500 through July 1990.

Figures showing entry by new motor carriers considerably understate the industry's competitive intensity, however. For example, total ICC Class I and II carriers decreased 27% from 3,435 in 1980 to 2,513 in 1989. But ICC figures on contract carriage, 48-state operating authority, and the number of brokers paint a more complete picture, with implications for the ICC subsector and the industry as a whole. Contract authority not only allows carriers to tailor specific service standards to individual shippers, but the fact that contract rates need not be filed at the ICC allows—and often forces—carriers to engage in aggressive rate cutting to secure shipper business. Although contract authority was once a small percentage of total permits, in 1990 nearly 75 percent of the entire ICC-regulated subsector held both common and contract operating authority. Similarly, whereas 48-state operating authority was held by only a few carriers in 1980, some 10,000 grants were in effect near yearend 1990. Since 1980, virtually all the major ICC-regulated LTL carriers have obtained 48-state authority, permitting them to aggressively expand into each other's markets. Finally, the number of ICC-licensed brokers continues to increase dramatically. Brokers match shippers with carriers, constantly booking freight reservations and generating powerful competitive pressures throughout the industry. Prior to 1980, fewer than 100 brokers were licensed by the ICC to "arrange" interstate movements of freight by motor carriers. In 1990 there were more than 6,500 licensed brokers, with 9,500 permits outstanding.

Table 3: Employment Distribution and Average Annual Compensation Among Primarily Interstate LTL* Carriers

Category	Number	Percent	Compensation($)
Drivers and helpers	171,066	40	34,000
Cargo handlers	120,146	28	16,000
Managerial	62,443	15	41,000
Clerical	49,155	11	20,000
Vehicle rep. & Serv.	15,732	4	28,000
Officers	1,026	0.2	110,000
Other	10,839	3	29,000
TOTAL	430,407	100	28,000

*Less-than truckload.

Notes: Cargo handler figure includes numerous part-time package handlers; the $28,000 industry average figure excludes officers' compensation.

SOURCE: ICC, *Transport Statistics, Motor Carriers Part 2, 1988*, Washington, D.C., 1990, pp. 10–11. Data base consists of 209 primarily LTL carriers; includes UPS employees.

Trucking industry output has paralleled overall growth in the U.S. economy. Reflecting substantial productivity increases, employment has increased at a somewhat slower pace. In 1989, total industry employment was estimated at 2.9 million, a 10 percent increase over 1980. In 1990, employment was approaching 3 million. The mix of employment categories within the industry, such as the number of drivers versus the number of cargo handlers, varies considerably among industry subsectors. Among TL carriers, which have no sorting terminals, drivers make up an estimated 65 percent of the workforce. Among LTL carriers, drivers and helpers account for about 40 percent of the workforce (Table 3).

Although "truck" freight can be hauled in nearly any sized vehicle, Class 8, 7, and 6 vehicles are considered the industry's workhorses. As in 1989, the 1990 heavy (8) and medium-duty (7,6) truck sales figures were headed lower from year-earlier levels. Sluggish traffic levels and concern about a possible recession apparently contributed to carriers' caution about new capital expenditures (Table 4).

Financial Highlights

Freight traffic levels for all modes generally move in concert with broader economic activity. Predictably, a recession in the early 1980s sharply reduced demand for truck service. Conversely, the past eight years of virtually uninterrupted economic growth increased ton and ton-mile levels and attendant demand for motor carrier service.

Table 4: Heavy Truck Sales

(units)

	Through July		Full Year		
	1990	1989	1989	1988	1987
Class 8	73,541	88,605	145,068	148,361	131,156
Class 7	51,340	56,916	93,446	103,042	102,583
Class 6	22,188	23,471	39,128	53,599	44,282

Notes: Class 8 vehicles are 33,000 lbs. gross vehicle weight; Class 7 are 26,001-33,000 gvw; Class 6 are 19,501-26,000 gvw. Class 8 full year sales represent close to 1% of total U.S. car & truck sales. All figures are "domestic retail," which are sales to U.S. end users and include imports.

SOURCE: Motor Vehicle Manufacturers Association.

The freight sector's relatively secure link to a historically growing U.S. economy generally ensures growth in demand for motor carriers' basic unit of output: a ton-mile, or one ton of freight hauled one mile. Revenues, operating margins, and net profits, however, do not always mirror this growth. Performance in 1990 was illustrative. Continuing new entry, changing market strategies among existing carriers, competition from railroads, and even growing competition from foreign freight carriers continued to pressure the industry's financial performance.

To the extent that the ICC's top 100 LTL and TL carrier results indicate industry-wide performance, 1990 real revenues per ton declined. In the first quarter of 1990, the top 100's year-to-year tonnage increased 4.2 percent to 44 million tons, but operating revenues grew only 6.3 percent. Adjusted for inflation, the nominal increase represented nearly a 2 percent real revenue per ton decrease.

Individual rate data, as opposed to figures derived from aggregate revenues, are monitored less closely in the motor carrier industry. Nonetheless, assertions of rate softening, evident in late 1989, were again widespread throughout the first quarter of 1990; constant-dollar declines in industry aggregate figures confirmed the claims. By mid-1990, however, year-earlier comparisons were less discouraging, and some rate firming was being reported.

Rates on some ICC-regulated traffic are initially set collectively by rate bureaus that enjoy limited antitrust immunity. However, even these rates are subject to severe downward market pressure, evidenced by individual carriers that often file discounts from approved general rate increases. Trade literature suggested discounting was again pervasive in 1990, especially during the first quarter.

In terms of revenue share, the ICC's top 100 carriers were performing in 1990 much as in 1989. Based on preliminary, annualized six-month figures, the top 100 accounted for approximately $34 billion of an estimated $73 billion ICC-regulated sector. Actual figures for 1989 are shown in Table 5.

Table 5: 1989 ICC Carrier Revenues, 1989

Industry Sector	Carriers	Revenues (billion dollars)
All ICC carriers	43,178	68.9
Top 100—total	100	32.4
Small package	UPS	10.0
LTL, General Freight	39	12.8
TL, General Freight	20	3.2
Other top 100 *	40	6.4

*Primarily household goods (HG), motor vehicle (MV), and chemical tank (CT).

SOURCES: ICC, "Large Class I Motor Carriers of Property Selected Earnings Data"; *Commercial Carrier Journal*, July 1990, and author's estimates.

Within these various subsectors, familiar names dominated. Three carriers led the LTL market: Yellow, Consolidated Freightways (CF), and Roadway. Each company had combined revenues in excess of $2 billion in 1989, although CF's and Roadway's subsidiaries contributed substantially to their totals.

As in prior years, revenues among ICC top 100 non-LTL general freight carriers varied widely, with 18 firms showing projected 1990 revenues above $200 million each. According to 1989 full-year figures, North American Van Lines led household goods carriers with $792 million in gross revenues; J.B. Hunt led TL general freight carriers with $510 million; chemical hauler Mattlack had $214 million; and auto hauler Anchor Motor Freight generated $257 million.

Growing expenses have compounded the problem of soft rates. In the ICC regulated LTL sector, labor, including executive and management salaries and employee fringe benefits, remain the largest expense category, or about 61 percent. Like many other expense categories, LTL labor costs are also increasing faster than rates (Table 6).

Because TL carriers are largely non-union and operate without terminals, labor takes up a smaller percentage of total operating costs, or about 40 percent.

Annual compensation varies considerably among employee types. Drivers in the heavily unionized LTL sector receive about $35,000 per year. A Bureau of Labor Statistics hourly figure of $11.65 (July 1990) suggests $23,000 in annual compensation for trucking and trucking warehouse employees. But this figure represents an industry-wide composite that includes numerous non-union drivers and other personnel.

The Teamster's National Master Freight Agreement (MFA), up for renwal in 1991, represents an estimated 200,000 members of the trucking industry. This is down from approximately 300,000 in 1980. Similarly, the number of carrier signatories to the MFA has declined, from about 600 in 1990 to 34. (The International Brotherhood of Teamsters (IBT) represents an estimated 1.6 million individuals, including those in non-trucking sectors of the economy.) At UPS, in contrast, the number of workers represent by the Teamsters has increased from approximately 80,000 to more than 140,000 since 1980. The UPS agreement, however, is separate and tailored to the company's need for seasonal and part-time workers. The three-year UPS agreement was renewed in 1990, granting 50-cent hourly increases a year to the existing average driver pay of $16.24 per hour. The UPS agreement also retained considerable work-hour flexibility in the company's rapidly growing air freight division.

Table 6: 1989 Financial Data For Selected ICC LTL Carriers, 1989

	Amount (billion$)	Percent	Percent Change 88–89
Operating revenues	13.1	100	6
Operating expenses	12.6	96	8
Sal., Wgs., & Frnge.	8.0	61	8
Op. supplies & Exp.	1.2	9	15
Op. taxes & licenses	0.4	3	9
All other expenses	3.0	23	5

Note: Fuel and fuel tax expenses total approximately 5% and are included within operating supplies and operating taxes.

SOURCE: *Commercial Carrier Journal*, July 1990; from ICC data of 112 LTL GF carriers; excludes UPS.

INTERNATIONAL COMPETITIVENESS

Growth in foreign trade potentially increases the number of shipments required to move goods. As part of the expanding trade-related transport, there are 1,700 so-called *maquiladoras*, or border town plants, in northern Mexico that assemble largely U.S.-made components into products returned to this country and sold here and abroad. Substituting transportation of parts and unfinished goods for labor expense helps keep production costs low. Demand for U.S. truck service (and other modes) increases as a result. The trucking industry also benefits when U.S. carriers gain access to foreign markets. A prime example is the recent opening of Canadian markets to U.S. truckers.

The European Community's (EC) single market plan for 1992 also represents a modest new opportunity for U.S. truckers. (Some 280 directives from the EC's 1985 treaty meeting should be codified by yearend 1992 and are scheduled to take effect January 1, 1993.) To the extent that the EC agreement lowers production costs and increases European consumers' disposable incomes, European export and import trade should grow. Freight carriers in the U.S. would participate in the resulting traffic movements. In addition to transport to and from Europe, the EC agreement should produce more freight transport within Europe. EC and non-EC transport carriers are positioning themselves by merging, forming marketing alliances, and—to a more limited extent—expanding operations. U.S. air cargo, package express, and small-package carriers have led the way in seizing new opportunities in Europe. But traditional trucking firms like Consolidated Freightways, Yellow, and Roadway are also establishing a presence there. Opening American transport markets to foreign operators introduces additional, albeit limited, competition. Canadian and Mexican motor carriers are examples, competing in both the LTL and TL sectors, for example. Additional capacity can also come from foreign ocean carriers that own double-stack containers. Although foreign (and domestic) ocean carriers routing double-stack freight from West Coast ports to central and eastern U.S. cities behave largely as transport customers (i.e. shippers), they often solicit backhaul freight to fill available container space. In this fashion, they compete with truckload carriers much as railroads do.

Foreign firms may also acquire U.S. carriers, or merge and enter marketing agreements with them. No new capacity is introduced under these circumstances, but sophisticated foreign firms can bring global transport expertise and financial resources that compete with U.S carriers outside the foreign firm's corporate alliance. (U.S. carriers allying with such firms would presumably benefit from these arrangements.) The growing number of international carriers—U.S. and foreign—with multiple mode freight-carrying capacity is evidence of these evolving global carriers. U.S. firms such as APC, CSX, and Roadway, and foreign firms such as TNT of Australia, British Airways, and Maersk of Denmark are examples.

Mexico deregulated its domestic trucking in 1989, adopting policies designed to yield many of the far-reaching benefits achieved initially by the U.S. in 1980 and Canada in 1988. Internationally, although much progress remains to be achieved, activity on the Mexico-U.S. bilateral front has increased dramatically during the last two years. For transport into the interior, Mexico still requires U.S. truckers to use Mexican drivers and tractors when reaching the border; thus U.S. operating authority into Mexico's interior is essentially non-existent. As a consequence of these restrictions, the 1982 moratorium on full Mexican carrier operating authority in the U.S. remains in effect, even though the U.S. offers certificates of registration (CR) for virtually unlimited authority in the U.S. commercial zone along the border. More than 2,600 Mexican carriers hold certificates of registration, but only 11 hold full ICC operating authority.

Nonetheless, recent progress is impressive. Serious dialogue on transportation issues has been established and efforts to reduce border delays have been undertaken. In October 1990, Mexican government officials expressed their intent to allow any ICC-authorized U.S. motor carrier to fully serve a 26-kilometer border zone within Mexico. The $50 billion in annual trade between the U.S. and Mexico represents a level of economic activity that carriers in both countries have a stake in capturing. Consequently, even without further political progress, firms have incentives to continue forming marketing and other corporate agreements with their cross-border counterparts. Given the encouraging progress at inter-governmental levels, however, eventually such marketing agreements may largely be replaced by single-firm through operations. Moreover, these transport developments could occur even before a full bilateral trade agreement is signed.

Outlook for 1991

Despite slow traffic growth and a soft rate environment, improved service holds the promise of revenue growth. Markets offering next-day and second-day delivery are quickly maturing, as competition in the $10-overnight package express service indicates. However, same-day delivery markets for express, small package, and even larger freight have room for growth. The total size of these markets is unclear and operational constraints are numerous; nonetheless, same-day is a premium service that should permit selected companies to sustain high margins for several years.

Companies with improved shipment tracking capabilities are also well positioned. These systems, which track individual shipments and vehicles, can entail considerable expense, and they will soon be a must for serious competitors. Nonetheless, they provide entre to the high-service, higher margin end of the market. It is estimated that over the past decade the intensely competitive environment resulting from transportation deregulation has produced up to $65 billion annually in reduced logistics outlays: $30 billion in savings from reduced inventory storage, and about $35 billion less in freight payments. Motor carriers account for more than $25 billion of these reduced freight payments, and more reliable motor carrier service has permitted growth in "just-in-time" manufacturing processes and led to much of the inventory savings. Whatever the marketing advantage carriers gain by applying advanced technology systems, use of the system produces efficiencies and improves U.S. global competitiveness.

Other opportunities for revenue growth will be scarce, at least in domestic markets. The ATA's Regular Common Carrier Conference, a trade organization representing some traditional LTL carriers, has urged the ICC to consider establishing minimum rates to cushion reportedly fierce price competition. However, "reregulation" of rates is unlikely in an economy increasingly driven by global market pressures. Instead, shippers are likely to enjoy a buyer's market in which soft rates are common.

Nor is the four-year old "filed tariff" debate likely to generate higher revenue for existing carriers. Even if shippers are forced to pay disputed past rate bills according to filed tariffs—not on the basis of lower, unfiled rates supposedly negotiated in good faith—most payments would accrue to the creditors of failed firms. To avoid future disputes, rate negotiations presumably will be strictly recorded in filed ICC tariffs or between parties in the form of written contracts. Thus, neither past resolutions nor future accommodations would provide existing carriers a substantial revenue windfall.

Overall, little increase in the total real revenue pie—either from more traffic or higher rates—is expected. Instead, most revenue opportunities will arise from shifts in market share among existing competitors as the industry shakeout continues. Further intrastate deregulation might also affect revenues. Despite a decade of interstate motor carrier deregulation, surprisingly few states have fully removed their own economic regulatory barriers—restrictions on entry, routes, commodities, rates, and so forth. The U.S. Department of Transportation has identified 15 states with moderate, some 27 states with strict, and only 8 states with virtually no economic regulation of motor carriers. Federal pre-emption of state motor carrier regulation, a policy encouraged by some package express companies, would dismantle state barriers and create revenue opportunities for truckers and package express firms that are not fully participating in those markets. The probability of such legislation is growing; it could be included in the 1991 highway reauthorization bill.

Perhaps the greatest opportunity for cutting costs rests with legislation for raising size and weight limits on the 45,000-mile Interstate Highway System. Although numerous exceptions exist, the basic weight limit on the interstate is currently 80,000 lbs. gross vehicle weight (gvw), a limit made uniform by the Surface Transportation Assistance Act of 1982. This law also allowed 48-ft. single trailers and vehicle combinations of twin 28-ft. trailers. With heavy trucks typically weighing 33,000 lb. empty, the 80,000 lb. gvw limit means freight capacity of over 40,000 lb. (20 tons). Some states already allow twin 48-ft. trailers, triple 28-ft. trailers, and other longer vehicle combinations. Consistent with Bridge Formula B, which establishes axle load limits, Twin 48's (with 9 axles) have a gvw of 134,000 lb.; triple 28's permit a gvw of 118,000 lb.

Potential cost savings from higher weight and longer combination vehicle (lcv) limits is a hotly debated subject. The operating costs per vehicle or per vehicle combination would certainly rise, but decline on a per ton-mile basis. To the extent costs would drop, the motor carrier industry's vast truckload subsector would gain the most. Railroads fear that such savings could help truckers sharply cut rail's market share, hurting total revenues and net operating income. One source claims that nationwide twin 48-ft. trailers could drop truckers' per-trailer costs from about 95 cents per mile to less than 60 cents. Truckers argue that the savings are less dramatic and, in any event, merely represent potential efficiencies that are now being lost.

Higher diesel fuel taxes and vehicle registration fees would cut into any gains from an increase in allowable truck weights and sizes. However, even if user fees were set at full cost recovery levels to cover highway construction and maintenance costs, truckers' operating savings could still exceed the fees. In any event, highway reauthorization legislation, initially passed every two years and more recently every four to five years, is scheduled to be taken up in 1991 and may contain some mix of higher weight limits and higher user fees.

Other potential cost savings would evolve if intrastate regulatory barriers were removed. Just as truckers realized fleet operating efficiencies when removal of interstate regulations in 1980 reduced empty mileage and route circuity costs, similar, albeit lesser, gains would result from eliminating state-sanctioned regulatory inefficiencies.

Finally, the industry has made substantial outlays for terminals, computerized data management, and package and vehicle tracking systems in the last several years. Carriers that invested in these programs should experience lower operating expenses in 1991, as well as revenue growth generated by higher quality service.

Competition and slowing economic conditions will constrain labor expense. However, the Teamster's three-year Master Freight Agreement scheduled for renegotiation in April should increase wages in the LTL sector. Similarly, the Department of Transportation's commercial driver license (CDL) program and other driver or vehicle safety programs could add to operating costs. Although outlays for training and safety compliance outlays may pay operating dividends in the long run, in the short term cash flow tends to be outward.

Extreme volatility in crude oil prices and seasonal factors in refining schedules make precise forecasts on fuel prices impractical. Through August, an ICC weekly index of selected, full-service diesel pump prices averaged $1.17 per gallon in 1990. Prices had pushed to $1.44 in response to cold weather in early January, declined steadily to a low of $1.06 in July, and shot up again to more than $1.40 in late August following the Iraqi invasion of Kuwait. These prices include the $0.14-per-gallon Federal excise tax plus the respective state diesel fuel taxes, which range from $0.075 to $0.228 per gallon. Prior to the Mideast crisis, fuel expense, including excise taxes, accounted for about 5 percent of LTL carrier costs and 20 percent of TL carrier costs. With no change in Federal or state diesel fuel taxes, crude oil prices at $30 dollar per barrel will probably yield diesel fuel prices in the $1.40-$1.50 range (full service, pump). Depending upon events in the Middle East, however, various outcomes—including crude oil prices that are low by recent historical standards—are still plausible in 1991.

Insurance expenses, which make up 2 to 5 percent of total operating expenses, could also trend upward. To the extent premiums or, alternatively, the mere availability of coverage reflects underwriters' perception of credit risk, a stalling economy would serve to raise premiums. At the state regulatory level, requiring insurance companies to cover all risk pool candidates also tends to raise overall premiums. Similarly, resistance to rate increases can induce insurance companies to withdraw from markets altogether, ultimately raising higher rates where coverage is still available.

Long-Term Prospects

No dramatic change is in the offing for the trucking industry. Instead, trends already under way will intensify. Competition pervades the industry's various subsectors, not only from other truckers but from railroads in the vast truckload subsector and from small-package and package-express carriers in the smaller LTL market. This competition will produce an industry increasingly characterized by computer and telecommunication links, larger trucks, more sophisticated global carriers and shippers, and blurred modal distinctions.—*Thomas M. McNamara, Office of Economics, Interstate Commerce Commission, (202) 275-7684.*

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RAILROADS

In 1990, there were 13 major independent freight railroads or affiliated railroad systems, defined by the Interstate Commerce Commission (ICC) as Class I carriers on the basis of having operating revenues of $93.5 million or more in 1989. These carriers accounted for more than 90 percent of the carloads handled by the railroad industry. The freight railroad industry also encompasses more than 500 smaller carriers (independent of Class I railroads), including local, regional, and switching and terminal railroads. Intercity rail passenger service is provided by Amtrak, a quasi-government corporation that handles approximately 22 million passenger trips per year across 43 states.

FREIGHT SERVICE

For the fourth year in a row, the railroad industry had record revenue ton-miles in 1990. (A revenue ton-mile is 1 ton of freight moved 1 mile). Revenue ton-miles rose an estimated 2 percent in 1990, largely on the strength of gains in coal shipments. Coal traffic increased between 4 and 5 percent as utilities replenished their inventories after an unseasonably cold December 1989, and then encountered milder than normal weather during much of 1990. Among other prominent rail-shipped commodities, chemical shipments rose between 1 and 2 percent, and intermodal traffic (trailer-on-flatcar and container-on-flatcar) grew an estimated 3 percent. Overall, however, results were mixed, with the volume of traffic down for the majority of commodities. Motor vehicles and parts were down 8 to 9 percent as a result of weaker auto sales; lumber and wood products were down between 5 and 6 percent as a result of the slowdown in residential construction; stone, clay, and glass fell between 3 and 4 percent in response to a decline in overall construction; and paper and paper products declined 2 to 3 percent. Traffic in grain was estimated to be relatively flat.

Average annual employment for the Class I railroads (including Amtrak) fell an estimated 5 percent, from 252,000 in 1989 to 239,000 in 1990. The sharp decline in workforce levels is continuing as several railroads adopt early retirement programs to reduce labor costs.

For the 12 months ended July 31, 1990, the industry earned 7.1 percent on net investment (excluding special charges). Since 1980, the year the Staggers Rail Act partially deregulated rail rates and services, the railroads have been able to put more than $100 billion into track and equipment. As a result, after decades of losing traffic to the highways, the railroads' share of total U.S. freight ton-miles has generally stabilized at slightly more than 35 percent. The industry's safety record also has improved dramatically, with the number of accidents dropping 70 percent from the late 1970s, and the rate of accidents per train-mile down more than 60 percent.

The improvements in railroad profitability and shipper service have not been achieved through sharp rate increases. In fact, the overall index of rail freight rates compiled by the Bureau of Labor Statistics (BLS) shows that in the nine years after the Staggers Act was passed, rates declined by 1 percent, in real terms, compared with an increase of 2.9 percent per year in the prior five years. Figures gathered from the railroads (which cover contract movements more fully than the BLS index) show that average rail freight rates for grain went down more than 27 percent from 1981 through 1988, even before adjusting for inflation.

Unresolved Issues

Wages and other labor-related expenses make up the largest element of railroad operating costs. Thus, labor issues remain a major focus for the railroads, including wage and benefit settlements, crew size, and work rules. The last four-year nationwide contract between most of the major railroads and the rail unions expired June 30, 1988. When the negotiations reached an impasse, a Presidential Emergency Board (PEB) was convened in May 1990 to investigate unresolved 1984

Trends and Forecasts: Class I Railroads (SIC 4011)

(in millions of dollars except as noted)

Item	1987	1988	1989	1990[1]	1991[2]	Percent Change 1987-88	Percent Change 1988-89	Percent Change 1989-90	Percent Change 1990-91
Operating revenue (billion $)	26.6	27.9	28.0	28.3	28.6	4.9	0.4	1.1	1.1
Revenue ton-miles (billions)	944	996	1,014	1,035	1,045	5.5	1.8	2.1	1.0
Average Employment (000)	271	259	252	239	232	−4.4	−2.7	−5.2	−2.9
Average hourly earnings ($)[3]	14.29	15.00[4]	15.68[4]	16.30[4]	—	5.0[4]	4.5[4]	4.0[4]	—

[1] Estimate.

[2] Forecast.

[3] Nonsupervisory employees only, including overtime.

[4] Nationwide rail labor contracts expired on July 1, 1988 and are still being renegotiated. This figure does not include projections of wage levels under new contract covering the period beyond that date.

SOURCE: Association of American Railroads; U.S. Department of Labor; Bureau of Labor Statistics; Railroad Retirement Board; and Federal Railroad Administration estimates developed from forecasts of numerous individuals and agencies.

health benefit issues, followed by a PEB on the expired 1988 contract. Under the Railway Labor Act (RLA), the old contract provisions will remain in place until either a new contract is ratified or the lengthy dispute-resolution procedures of the RLA have been exhausted. This round of negotiations could be critical for the industry; some of the large carriers are participating in the national bargaining on most broad issues, such as health benefits, but are negotiating separate contracts with the unions on a limited number of issues, such as the minimum number of employees for each train crew.

Since 1908, railroad worker's compensation benefits have been governed by the Federal Employers Liability Act (FELA). Unlike no-fault worker's compensation, the state-based system for other industries, FELA requires employees to prove railroad negligence for on-the-job injury in order to collect damages. The amount of damages is determined either through negotiation or litigation. The Department of Transportation's *Moving America: New Directions, New Opportunties; A Statement of National Transportation Policy Strategies for Action* (February 1990) cites FELA as an outmoded requirement that keeps railroads from competing on an equal basis with other modes of transportation and calls for its repeal.

The railroads are moving ahead with innovations in equipment, computerized freight tracking and train scheduling, and marketing. New types of service, particularly for intermodal traffic, also are being offered. Rail intermodal traffic has nearly doubled between 1980 and 1989, from 3.1 million trailers and containers to 5.9 million. Two major events account for the increase: the ICC's 1981 exemption of intermodal traffic from rate regulation, and the introduction in 1984 of railcars with a depressed well, or platform, that carry two containers stacked on top of each other. Growing volumes of containerized imports from the Far East have been moving through West Coast ports to inland destinations on such double-stack trains under expedited schedules, carrying exports and domestic traffic on the backhaul. More than 100 double-stack trains depart the West Coast weekly with double-stack traffic. Double-stack cars now account for about 25 percent of total intermodal capacity—and the share of container traffic in intermodal loadings has nearly doubled from 25 percent in 1980 to nearly 50 percent in 1990.

A U.S. Department of Transportation study, *Double-Stack Container Systems: Implications for U.S. Railroads and Ports,* jointly sponsored by the Federal Railroad Administration and the Maritime Administration, was released in June 1990. The report concluded that although about 83 percent of intercity truck traffic moves in hauls of less than 500 miles, double-stack services can be fully competitive with trucks in dense traffic corridors of 725 miles or more. In the major long-haul markets of Seattle-Chicago and Los Angeles-Chicago, double stacks have already diverted significant volumes of truck traffic, and additional opportunities exist in these and other corridors, some secondary corridors, and for refrigerated commodities.

Mergers and Acquisitions

The corporate and physical structure of the U.S. freight railroad industry continues to evolve. Although the pace of mergers between major railroads has slowed considerably, restructuring continues through purchases or transfers of smaller portions of rail systems. Among the more recent developments, in October 1989 the ICC approved the purchase of the Chicago and North Western Transportation Company (CNW) by a consortium of investors headed by Blackstone Capital Partners. As part of the transaction, the Union Pacific (UP) acquired $100 million in preferred stock in the new company, and under the proposed trackage rights agreement over CNW between Fremont, NE/Council Bluffs, IA and Chicago, the Union Pacific obtained a commitment from the CNW to spend $115 million to upgrade the line during 1989 and 1990. The UP's February 1990 application for approval of the trackage rights agreement is pending at the ICC.

Rio Grande Industries, Inc., (RGI) received ICC approval in September 1989 to acquire the St. Louis-Chicago line from the bankrupt Chicago, Missouri & Western Railway. In another RGI proceeding, the ICC in July 1990 approved the company's application to acquire the Soo Line's Chicago to Kansas City line. A portion of this line included Soo Line trackage rights over a CNW line segment. RGI and CNW were unable to agree on trackage rights compensation for the CNW segment and in August 1990 the RGI-Soo Line agreement was terminated. At the same time, RGI announced that it had reached agreement with Burlington Northern (BN) to gain access into Chicago through trackage rights over BN's from Kansas City. In late September 1990, the RGI-BN trackage rights agreement was exempted from ICC regulatory review, but the ICC is reviewing petitions to revoke the exemption.

In October 1990, the ICC approved the Canadian Pacific (CP) acquisition of the Delaware and Hudson Railway Company (D&H) and related trackage rights over other rail carriers. The CP had operated over the D&H on an emergency basis since the beginning of August 1990, replacing the bankruptcy trustee who had operated the line since the end of February 1990. Subsequent to the D&H's bankruptcy and cessation of operations in June 1988, operations were performed by the New York, Susquehanna and Western Railway.

The Staggers Act did not completely deregulate the freight railroads, but it did take significant steps to remove ICC authority over railroad activities in which competition was already working to constrain rail rates and improve service.

In one of the most important provisions of the Staggers Act, railroads and shippers were permitted for the first time to enter into confidential, legally binding contracts covering rail rates and services. These contracts must be filed with the ICC, but the specific rates and conditions are not disclosed. In 1989, more than 16,000 contracts were signed. All told, more than 105,000 contracts between railroads and shippers were entered into from the time the Staggers Act was signed to mid-1990.

The Staggers Act allows railroads to raise individual rates to cover increases in costs each quarter—as measured by an ICC-approved index of railroad costs—without additional review by the ICC. Beyond that zone of flexibility, the ICC retains authority to regulate rates for traffic for which there is no effective competition. For an individual rate subject to ICC review, the Commission established in its September 1985 guidelines on coal rates that the maximum a shipper can be required to pay will be the stand-alone costs of

Association of American Railroads

The ability of railroads to attract bulk commodities, their mainstay, depends on their ability to meet competition from other modes of transportation, especially trucks.

providing the required transportation service. The ICC defines stand-alone costs as all capital and operating costs (including a return on capital) that would be incurred by a hypothetical least cost, most effective carrier, if it were serving only the shipments at issue in the case or a group of shippers using essentially the same facilities. The ICC may adjust its maximum rate findings if a railroad has inefficient rates in other parts of its system that should be making up some of the revenue shortfall, could collect needed revenues according to a more gradual phasing-in of rate increases, or has achieved revenue adequacy.

Rate Standards

In April 1987, the ICC proposed simplified formula-based rate standards as a surrogate for stand-alone costs, which were based on a rulemaking proceeding that considered what guideline to use in regulating non-coal rates and particularly rates for small shippers. The ICC maintained that if shipments come from numerous origins or involve small volumes, the stand-alone cost methodology is too costly and complicated to be used. In several non-coal cases, the ICC has applied the proposed standards and has found that maximum reasonable rates under the proposal would be below the level of the rates being charged. The railroads protested that the proposals were not economically sound and would produce unjustified and debilitating rate reductions. The question is still being debated.

Most rail rates are not determined by the outcome of a particular rate case at the ICC. Of the 864 rate complaints filed by shippers at the time the Staggers Act was passed, only a few have not yet been resolved. The remainder have been dismissed, withdrawn, or settled through negotiations between the railroads and shippers. Recently, an average of only 16 new rate complaints/protests have been filed per year, down sharply from an annual average of nearly 300 before the Staggers Act went into effect.

In 1986, the ICC responded to some shippers' concerns that its standards for determining the adequacy of railroad revenues might not accurately reflect broader market perceptions, and modified its procedures and methodology to bring them closer to those of other industries. The new rules make it more likely for a railroad to be found revenue-adequate. In August 1990, the Commission found the Florida East Coast Railroad and Norfolk Southern Corporation were revenue adequate in 1988, with returns on net investment (ROI) of 14.6 and 13.1 percent, respectively. This was well above the commission-determined 11.7 percent current cost of capital in 1988.

Under the Staggers Act, a revenue adequate carrier cannot apply surcharges to certain light density lines, nor

can it take increases using the zone of rate flexibility for rates linked to the rail cost adjustment factor (RCAF). (The RCAF is the measure of the inflation-based rate increases railroads can charge without ICC review.) The effect of these conditions should be minimal. With respect to coal rate guidelines, where a finding of revenue adequacy could limit maximum rate levels, the ICC has stated that it will not view a single year's revenue adequacy finding as a constraint on coal rates.

Another recent rulemaking involved an index of costs railroads incur and on which the ICC relies to establish the RCAF. In March 1989, the ICC discounted the RCAF by a factor that reflects rail productivity gains. Shippers had long argued that Congress did not intend railroads to receive the full extent of such gains through the RCAF automatically. In July 1990, the ICC allowed the Class I railroads to cancel their participation in rail carrier cost recovery master tariffs, thereby de-linking the rates from the RCAF. The railroads had petitioned for this change just prior to July 1, 1990, when rates tracking the RCAF would have had to be reduced by 1 percent because productivity gains had offset cost increases. This followed ICC-ordered decreases of 0.4 and 0.2 percent in the first and second quarters of 1990. Individual railroads will still be able to raise rates to cover increases in costs, but such increases are now subject to challenge at the ICC under certain circumstances. (For additional background on the Staggers Rail Act, see the 1990 Industrial Outlook, chapter 42.)

Outlook for 1991

Rail traffic volume is forecast to be relatively flat compared with 1990. Coal traffic, the top commodity carrie by the railroads, is expected to grow by 1 to 2 percent i 1991, in line with industry and government forecasts c increased coal production. Intermodal traffic is expected t grow by 2 to 3 percent in tandem with the increasin importance of container and double-stack service. Traffi in chemicals is expected to increase by 1 percent. Traffic i lumber and wood products, metallic ores, primary meta products, motor vehicles and parts, and stone, clay an glass should decline as a consequence of slow economi growth. Railroad employment is forecast to decline b approximately 3 percent to 232,000, in part because early retirement programs are continuing.

Long-Term Prospects

Traffic growth over the next five years will be modest. Rai tonnage is expected to rise an average of 1.0 to 1.5 percent per year. Railroad traffic volume, however, is heavily dependen on the strength of industrial production and shipments, particularly in the key industries served by rail, such as steel, chemicals, automobiles, paper, construction, and agriculture. The primary source of rail traffic is still bulk commodities, including coal for generating electricity and producing steel. Coal is likely to continue to account for approximately 4 percent of rail-shipped tonnage over the next five years.

Railroads' prospects for attracting bulk commodities and other goods will be affected by their ability to meet competi-

Association of American Railroad

Traffic of coal, the top commodity carried by the railroads, is expected to grow 1 to 2 percent in 1991.

best copy available

tion from other modes of transport. Barges are major competitors for bulk commodities, including coal and grain, which move in large volumes on the Ohio and Mississippi River systems. Trucking is also an important option for many shippers. Railroads' share of U.S. intercity freight ton-miles was 37 percent in 1989, down sharply from 56 percent in 1950, although their share has held fairly steady at about 35 to 40 percent since the early 1970s. Most of the loss reflects a shift to trucks for short-distance shipments.

The competitive challenge will continue, especially if motor carriers continue to improve efficiency and truck size and weight increase. But railroads should have an opportunity to hold or improve their traffic base in competition with other modes because of improved overall efficiency brought about by mergers, better equipment utilization, and technological innovations. Railroads' increasing attention to the quality of service, aggressive marketing, and effective use of railroad-shipper contracts also will give the industry a chance to retain or improve its market share. Railroads have the capacity to accommodate more traffic because major carriers have invested heavily in renewing track and structures over the last several years, and the industry's plant is in excellent condition.

Rail Passenger Service

The National Railroad Passenger Corporation, better known as Amtrak, operates about 220 intercity passenger trains per day over 24,000 miles of rail line, serving more than 500 communities in 43 states. Each year, Amtrak carries close to 40 million passengers—more than 22 million on its intercity trains and about 17 million metropolitan commuters (the latter under contract with various transportation authorities).

Amtrak had another record year in fiscal 1990 with revenues of about $1.3 billion, up 5 percent from the year before. Expenses rose about 4 percent to $1.8 billion. The system matched the previous year's record-high revenue-to-expense ratio of 72 percent. Passenger-miles traveled on Amtrak increased from 5.9 billion to 6.1 billion between fiscal 1989 and fiscal 1990.

Amtrak received a federal subsidy of $605 million for fiscal 1990, plus an additional $24.4 million for the Northeast Corridor Improvement Project between Washington and New York. In constant dollars, Amtrak's fiscal 1990 subsidy represented a reduction of more than 50 percent from its fiscal 1981 Federal appropriation. The substantial drop was achieved without route reductions, but rather through a combination of fare and ridership increases and close control of expenses.

By taking over responsibility for the train and engine crews from the freight railroads over whose lines its trains operate, Amtrak has achieved major improvements in productivity. This shift, which began in fiscal 1986, saves Amtrak more than $50 million per year and gives it better control over its operations. Consolidation and upgrading of car and locomotive repair shops also have resulted in considerable savings.

Amtrak began many new services in fiscal 1990. It extended the "Crescent" in Alabama from Birmingham through Montgomery to Mobile (the "Gulf Breeze"); added one more "San Joaquin" train between Oakland and Bakersfield, with connecting bus service to Los Angeles; extended the "Atlantic City Express" between Atlantic City and New York, Philadelphia, and Washington to Richmond, Va; operated three daily Atlantic City-Philadelphia round trips to the Midway Airlines Terminal at Philadelphia International Airport; and launched a new train, the "Carolinian," between Rocky Mount and Charlotte, NC, where it combines with the "Palmetto" to continue the New York. Amtrak also increased to two the number of daily roundtrip nonstop "Express Metroliners" between New York and Washington. In each instance, passenger revenues from these extensions are projected to meet or exceed the cost of the new service. A rail replacement program jointly funded by Amtrak, California, the Santa Fe Railway, and Los Angeles, Orange, and San Diego Counties is under way to enhance service and reduce congestion and automobile pollution along the San Diego-Los Angeles Corridor.

Rebuilding the rail line along the west side of Manhattan continues. The "West Side Connection" scheduled to be completed in the spring of 1991 will enable Amtrak trains from upstate New York to bypass Grand Central Terminal and operate directly into Pennsylvania Station. Thus passengers will not have to change trains and stations in New York City. Major work progressed in fiscal 1990 at New York's Penn Station, Philadelphia's 30th Street Station, and Chicago's Union Station.

In January 1990, Amtrak took delivery of the last of its $100 million order of new, short-distance Horizon Fleet cars, made by the Bombardier Corporation of Canada and assembled in Barre, VT. The 104 coaches and food service cars began revenue service in Chicago (78 cars) and Oakland-Bakersfield (26 cars). The new cars will increase Amtrak's capacity about 9 percent, which will help alleviate the overcrowding of trains and reduce the number of customers who are turned away when seats are sold out. Amtrak also proposed to purchase an additional 75 to 179 Superliner type cars in late 1990.

Outlook for 1991

The total passenger-miles traveled on Amtrak is expected to grow an estimated 3 percent, and revenue per passenger-mile is expected to increase by 2 percent in constant dollars. Part of the passenger-related revenue increase will come from state-supported service in California, North Carolina, and Alabama. Atlantic City traffic is a key market for expansion in the next few years, as Amtrak continues to work with the casinos there to build ridership. Amtrak forecasts that non-passenger-related revenue, including contract commuter service, real estate operations, and mail and baggage, will reach $416 million, up a strong 9 percent from $380 million in fiscal 1990.

Long-Term Prospects

Through 1995, Amtrak passenger-miles are expected to continue to grow by 2 to 3 percent per year. Amtrak's basic goal is to continue to improve rail passenger service while reducing its dependence on Federal support. Amtrak management believes that with adequate capital funding it can continue to improve its revenues and efficiency and cover more of its costs. Amtrak intends to replace its 35- to 40-year-old long-distance Heritage equipment with single-level Viewliner cars to operate on Eastern and other low-clearance routes. This will increase capacity and lower maintenance costs. Under Amtrak's plan, the cars would be purchased between fiscal 1991 and fiscal 1994. Adding equipment also would enable Amtrak to add new service in markets where the resulting revenues would exceed the cost of providing the service.

Amtrak is seeking legislation exempting it from the Federal Employers' Liability Act and replacing the formula for determining contributions to the Railroad Unemployment Insurance Act with a cost share based on the actual share of unemployment payments to workers. The objective is to relieve the railroad of costs it deems excessive.

High-Speed Passenger Service

Interest in high-speed passenger rail service has increased in the last several years. This form of passenger travel is seen as a way of reducing highway congestion and relieving airport and airway congestion by reducing short-haul air traffic. High-speed rail passenger systems (defined as operations above 120 mph) are typically electrified. Currently, the only high-speed service in the U.S. is the Amtrak Metroliner in the Northeast Corridor, which runs at a maximum speed of 125 mph. Germany and Japan have been testing magnetic levitation (maglev) systems with speeds up to 300 mph that rely on magnetic forces to provide a non-contact means of propulsion, braking, suspension, and lateral guidance. Recently, the French TGV, a steel wheel-on-steel rail system, achieved a record 320 mph in a test run. The train operates at 187 mph in regular service.

Several state and local governments and private sector groups have undertaken market feasibility studies on the potential for high-speed service, in some cases with grants from the Federal Railroad Administration (FRA). Corridors include Miami-Tampa-Orlando; New York-Boston; New York-Montreal; Houston-Dallas-Fort Worth-Austin-San Antonio,TX; Philadelphia-Harrisburg-Pittsburgh; Las Vegas-Anaheim; Los Angeles-Fresno-Bay Area-Sacramento; Minneapolis/St. Paul-Madison-Milwaukee-Chicago; Seattle-Moses Lake, WA; and Cincinnati-Columbus-Cleveland. Florida is moving toward awarding a franchise to private developers to construct and operate a 13.5-mile maglev segment between Orlando Airport and a nearby resort area, as well as a franchise for a high-speed rail line serving Miami-Orlando-Tampa. Texas' newly created High Speed Rail Authority has received letters of intent from two groups interested in building and operating a high-speed network in that state. One would use the technology of French TGV and the other the technology of the German intercity express. Las Vegas conducted a feasibility study of a very high-speed rail or maglev line connecting it with Los Angeles, and California and Nevada recently created the California-Nevada Super Speed Ground Transportation Commission to solicit and review applications for private construction and operation of such a line. The Commission received one franchise proposal to privately finance, build, and operate a 300-mph magnetic levitation train system over a 265-mile double tracked route from Las Vegas to Anaheim.

In a congressionally mandated study completed in June 1990, the Department of Transportation concluded that in a limited number of high-density intercity transportation markets, maglev systems in the U.S. have the potential for attracting travelers for distances of 100 to 600 miles. In addition to reducing congestion, such systems could provide substantial fuel savings and reduce air pollution.

The FRA is continuing research on high speed rail and magnetically levitated systems to ensure that these systems are safe. The FRA and the U.S. Army Corps of Engineers are co-chairing the National Maglev Initiative, an interagency committee formed to evaluate the future role of maglev in the U.S., assess the current status of maglev, and create a partnership with industry to stimulate research and development. The fiscal 1991 budget contains a request for nearly $10 million for maglev research.—*Joel P. Palley, Federal Railroad Administration, U.S. Department of Transportation, (202) 366-0348, October 1990.*

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WATER TRANSPORTATION

The U.S. water transportation industry (SIC 44) consists of deep sea foreign and domestic transportation (including passenger ships), Great Lakes-St. Lawrence Seaway carriage, inland waterway movements, and local waterborne cargo.

The gross national product (GNP) attributable to the water transportation industry is estimated at $7.5 billion based on 1987 data. Employment decreased by 3 percent to an average of 176,000 workers in 1989, from an annual average of 181,600 in 1988. Preliminary estimates indicate that an average of 165,400 workers were employed in the industry during the first four months of 1990.

Deep sea foreign and domestic water transportation includes three cargo categories: general cargo, dry bulk, and liquid bulk. General cargo operations, predominantly movements of finished goods, usually are performed by regularly scheduled vessels operating as common carriers in liner service. Dry bulk cargoes, such as grain, coal, ore, and fertilizer, move in specialized vessels under contract or proprietary carriage. Liquid bulk cargoes, primarily crude oil and refined petroleum products handled by tanker and tank barge fleets, normally are transported on a proprietary basis. International cargo movements are generally expressed in long tons (2,240 pounds) and domestic cargoes in short tons (2,000 pounds).

DEEP SEA FOREIGN TRANSPORTATION

The U.S.-flag deep sea foreign trade shipping industry (SIC 441) carries merchandise between U.S. and foreign ports in direct competition with the ships of the world fleets. Preliminary data indicate that in 1989 the U.S.-flag deep sea foreign trade fleet carried 35.7 million long tons of cargo (Table 7), valued at $69.7 billion (Table 8). This represents an increase of 16 percent in tonnage and an increase of 21 percent in value compared with 1988. U.S.-flag carriage in 1989 accounted for 4.3 percent of all U.S. oceanborne foreign trade by tonnage and 16.1 percent by value. In 1989, the U.S.-flag foreign trade fleet continued to carry a greater proportion of high-value liner cargo tons (18.8 percent) by weight than of low-value, non-liner cargoes (1.7 percent) or tanker cargoes (3.4 percent).

Deep sea foreign transportation is a source of both receipts and payments for balance-of-payments accounting purposes. In 1989, the balance-of-payments deficit for international ocean transportation declined to $1 billion, from $1.5 billion in 1988. (In ocean freight movements, the importer generally pays freight charges.) U.S. receipts and payments for international ocean transportation are shown in Table 9.

The U.S.-flag foreign trade liner fleet is composed of general cargo ships and intermodal ships. General cargo ships include breakbulk vessels, partial containerships, and other ships designed to carry non-containerized cargo. Intermodal ships primarily consist of containerships, roll-on/roll-off vessels, and container/barge vessels. Vessel size is measured in deadweight tons (DWT), the amount of water (in long tons) that a ship displaces, including cargo, stores, and fuel. As of April 1, 1990, the U.S.-flag liner fleet operating exclusively in foreign trade (including foreign-to-foreign trade) consisted of 105 vessels totaling 3.1

Table 7: Tonnage of Commercial Cargo Carried in the U.S. Oceanborne Foreign Trade

(in thousands of long tons)

		1988			1989[1]		
		Total	U.S. Flag		Total	U.S. Flag	
			Tons	Percent		Tons	Percent
Inbound	Liner	39,421	7,160	18.2	43,806	9,123	20.8
	Nonliner	106,178	1,340	1.3	120,266	2,115	1.8
	Tanker	308,011	8,664	2.8	320,883	10,098	3.1
Outbound	Liner	43,916	6,885	15.7	47,296	7,981	16.9
	Nonliner	254,925	4,801	1.9	263,669	4,358	1.7
	Tanker	33,574	1,825	5.4	37,354	1,982	5.3
Total	Liner	83,337	14,045	16.9	91,102	17,104	18.8
	Nonliner	361,103	6,141	1.7	383,935	6,473	1.7
	Tanker	341,585	10,489	3.1	358,237	12,080	3.4
Total All Services		786,025	30,675	3.9	833,274	35,657	4.3

[1] Preliminary

SOURCE: U.S. Department of Transportation, Maritime Administration, based on Bureau of Census data. Includes government-sponsored cargoes, but excludes Trans-Lakes and Department of Defense cargoes.

Table 8: Value of Commercial Cargo Carried in U.S. Oceanborne Foreign Trade

(in millions of dollars)

		1988			1989[1]		
		Total	U.S. Flag		Total	U.S. Flag	
			Tons	Percent		Tons	Perce
Inbound	Liner	172,084	39,504	23.0	187,397	47,798	25.5
	Nonliner	59,213	1,952	3.3	58,355	2,998	5.1
	Tanker	35,873	997	2.8	43,884	1,349	3.1
Outbound	Liner	81,343	13,624	16.7	87,932	16,001	18.2
	Nonliner	49,779	1,211	2.4	45,047	1,131	2.5
	Tanker	9,484	412	4.3	10,311	459	4.5
Total	Liner	253,427	53,128	21.0	275,329	63,799	23.2
	Nonliner	108,992	3,163	2.9	103,402	4,129	4.0
	Tanker	45,357	1,409	3.1	54,195	1,808	3.3
Total All Services		407,776	57,700	14.1	32,926	69,736	16.1

[1] Preliminary

SOURCE: U.S. Department of Transportation, Maritime Administration, based on Bureau of Census data. Includes government-sponsored cargoes, but excludes Trans-Lakes and Department of Defense cargoes.

Table 9: U.S. Receipts and Payments for International Ocean Transportation

(in millions of dollars)

Item	1988[1]	1989[2]
Total receipts	11,135	11,628
Freight	3,667	3,820
Port expenditures	7,315	7,609
Charter Hire	153	199
Total payments	12,641	12,641
Import freight payments	9,505	9,483
Passenger fares	328	322
Port expenditures	2,244	2,228
Charter hire	564	608

[1] Revised

[2] Preliminary

Note: Data represent international transportation transactions recorded for balance-of-payment purposes. Receipts include freight on exports carried by U.S.-operated carriers and foreign carrier expenditures in U.S. ports. Payments include freight on imports carried by foreign carriers and U.S. carrier port expenditures abroad. Freight on exports carried by foreign carriers is excluded since such payments are directly or indirectly for foreign account. Similarly, freight charges on U.S. imports carried by U.S. carriers are domestic rather than international transactions.

SOURCE: U.S. Department of Commerce, Bureau of Economic Analysis.

million DWT. These ships included 79 intermodal vessels with a capacity of 2.6 million DWT (Table 10).

The intense competition that has existed in the international liner trades in recent years continues. The U.S. foreign trade routes have been among the most lucrative in the world. For this reason, considerable excess capacity exists on these routes which, in turn, depresses freight rates.

Although carriers in the transatlantic trade have made major efforts to reduce capacity in recent years, and despite a greater volume of trade, freight rates for containerized trade generally remain below the depressed levels of 1988. In the transpacific trade, growth in the volume of U.S. imports has been unexpectedly strong. The increase in U.S. exports to the Far East has also contributed to improving conditions in this trade. In addition, a 1989 agreement to reduce container capacity by 10 percent among the major carriers in the transpacific trade has brought some improve-

Table 10: Employment of U.S.-Flag Oceangoing Merchant Fleet Vessels of 1,000 Gross Tons and Over as of April 1, 1990[1]

(tonnage in thousands)

			Vessel Type									
	Total		Passenger and Cargo		General Cargo		Intermodal		Bulk Carriers[2]		Tankers[3]	
	No	DWT	No	DWT	No	DWT	No	DWT	No	DWT	No	DWT
Grand Total	634	24,190	9	86	196	2,472	169	4,721	26	1,269	234	15,642
Active vessels	378	17,782	7	59	36	546	125	3,689	20	853	190	12,635
Privately owned	369	17,690	2	14	35	535	123	3,670	20	853	189	12,618
U.S. foreign trade	125	4,543	0	0	26	406	69	2,340	13	631	17	1,166
Foreign-to-foreign	28	2,462	0	0	0	0	10	268	0	0	18	2,194
Domestic trade	163	9,254	2	14	1	14	23	480	7	222	130	8,524
Coastal	93	3,757	0	0	1	14	0	0	5	172	87	3,571
Noncontiguous	70	5,497	2	14	0	0	23	480	2	50	43	4,953
MSC charter	53	1,431	0	0	8	115	21	582	0	0	24	734
Government owned	9	92	5	45	1	11	2	19	0	0	1	17
Inactive vessels	256	6,408	2	27	160	1,926	44	1,032	6	416	44	3,007
Privately owned	33	2,434	1	16	8	99	5	134	3	135	16	2,050
Temporarily inactive	5	177	0	0	2	29	0	0	2	118	1	30
Laid-Up	22	2,092	1	16	2	15	4	104	1	17	14	1,940
Laid-Up (MARAD Custody)	6	165	0	0	4	55	1	30	0	0	1	80
Government Owned (MARAD Custody)	223	3,974	1	11	152	1,827	39	898	3	281	28	957
National Defense Reserve Fleet	212	3,342	1	11	150	1,801	36	795	0	0	25	735
Ready Reserve Force (RRF)	94	1,740	0	0	51	703	32	742	0	0	11	295
Other reserve	118	1,602	1	11	99	1,098	4	53	0	0	14	440
Special programs[4]	0	0	0	0	0	0	0	0	0	0	0	0
Non-Retention[5]	2	26	0	0	2	26	0	0	0	0	0	0
Other Government Owned	9	606	0	0	0	0	3	103	3	281	3	222

[1] Excludes vessels operating exclusively on the inland waterways, Great Lakes, and those owned by the United States Army and Navy, including special types such as cable ships and tugs.

[2] Includes tug barges.

[3] Includes tanker barges and LNG vessels.

[4] Vessels unavailable for activation due to special status.

[5] Vessels not actively maintained.

SOURCE: U.S. Department of Transportation, Maritime Administration, U.S. Merchant Marine Data Sheet, pg. 3, April 1, 1990.

ment in rates on the eastbound leg. This agreement will be in effect until March 1991.

As U.S. exports continue to increase, the imbalance appears to have stabilized. Imports were 53.5 percent of the total containerized trade in 1988, 53.3 percent in 1989, and are expected to have been 53 percent in 1990.

Net earnings for the U.S.-flag foreign trade liner fleet were $36 million in 1989, a decrease of 66 percent from 1988 (Table 11). According to industry estimates, net earnings during 1989 were lower than expected because of increased competition.

Table 11: Summary Financial Data for the U.S.-Flag Foreign Trade Liner Companies

(in millions of dollars)

Item	1988[1]		1989	
	Dollars	Percent	Dollars	Percent
Gross revenue	4,211	100.0	4,582	100.0
Operating expense	(3,959)	(94.0)	(4,392)	(95.9)
Operating differential	181	4.3	193	4.2
Operating profit	433	10.3	383	8.4
Depreciation	(144)	(3.4)	(188)	(4.1)
Gross profit or loss	289	6.9	195	4.3
Interest expense	(125)	(3.0)	(131)	(2.9)
Taxes	(57)	(1.4)	(28)	(0.6)
Net profit or loss	107	2.5	36	0.8

[1] Revised

SOURCE: U.S. Department of Transportation, Maritime Administration.

Although worldwide demand for bulk shipping services has been increasing, freight rates remain below break-even levels for U.S.-flag foreign trade liquid and dry bulk carriers. The capacity of the active U.S.-flag dry bulk fleet engaged in the foreign trade has decreased from 734,000 DWT in April 1989 to 631,000 DWT as of April 1, 1990. The U.S. foreign trade tanker fleet (including foreign-to-foreign trade) decreased to 35 vessels totaling 3.4 million DWT in April 1990, from 47 vessels (4.1 million DWT) in April 1989. As of April 1990, 18 of the 35 U.S.-flag tankers were operating in the foreign-to-foreign trade.

Outlook for 1991

The U.S. economy is expected to continue to grow slowly in 1991. This slowdown, along with a weaker dollar and lower consumer spending, is expected to restrain the growth of U.S. liner import cargoes. Liner export cargoes are expected to continue to increase slightly as the economies of U.S. trading partners continue to expand and the dollar weakens. The U.S. container trade imbalance is expected to decrease slightly in 1991 U.S. container trade has been reduced. Since 1988 this shipments.

New, larger containerships are being introduced into the trade by foreign-flag operators as they attempt to improve economies of scale. As a result, freight rates may weaken during the year as the new ships enter service on the major U.S. foreign trade routes.

U.S.-flag liner operators could benefit from an April 1990 Department of Defense rule that will require close monitoring of DOD cargo movements to assure carriage on U.S.-flag vessels. This rulemaking could bring additional revenues to the U.S.-flag fleet.

Conditions in the international bulk trades are expected to continue to improve. The outlook for freight rates in the dry bulk market is more positive than in recent years. The world market is expected to stabilize in 1991.

The outlook for the tanker market is uncertain for 1991 because of changes in the sources of supply of crude petroleum in 1990. In the past few years tanker rates have been more positive because owners have rationalized tonnage and scrapped many of their surplus vessels. Worldwide demand for tanker tonnage will be significantly influenced by the crude oil trade and economic activity. In particular, demand for imported petroleum will rise as domestic production continues to decline.

The Oil Pollution Act of 1990 requires tankers calling at U.S. ports to pay a 5 cents-a-barrel fee to be used for cleaning oil spills and compensation for damage. In addition, tanker operators will face unlimited liability for spills. Several operators have announced that they will limit service or stop calling at U.S. ports.

World seaborne trade in the three major dry bulk commodities, coal and coke, iron ore, and grain is expected to increase during 1991. Shipments of coal and coke are projected to increase by 4.6 percent, while iron ore shipments are projected to grow by 2.8 percent. U.S. exports of coal and coke are expected to increase by 5 percent during the 1990-91 period and iron ore imports are expected to increase by 6 percent in 1990-91. World seaborne trade in grain is expected to increase by 3 percent in 1991. U.S. exports of grain are projected to increase 3.4 percent in 1990-91.

Prospects for the U.S.-flag foreign trade dry bulk and tanker fleet will continue to depend on the volume of preference cargoes—that is, those which are required to be carried in U.S. flag vessels—and on freight rates earned in these trades. The volume of preference cargoes in the dry bulk trade could increase in 1991. The Food and Agriculture Resources Act of 1990, if signed by the President, will increase the share of food aid cargo carried by U.S.-flag bulk carriers beginning in 1991. A portion of the demand for U.S.-flag tankers in the preference trade will be in the movement of crude oil for the Strategic Petroleum Reserve.

Long-Term Prospects

Total U.S. containerized trade is expected to grow at an annual rate of about 3.7 percent between 1991 and 1995. However, capacity is expected to increase more rapidly than containerized trade because of continuing world orders for larger new containerships. As of May 1990, 176 fully cellular containerships were on order. The world orderbook for new containerships is equivalent to 18 percent of the capacity of the existing fleet. The average size of a fully cellular containership on order is 26,000 DWT, compared with 21,000 DWT in the existing fleet. Excess capacity will exist on the most profitable routes and put pressures on rates as operators try to capture and maintain market share.

For the 1991-1995 period, U.S. liner import cargoes are expected to grow about 3.8 percent annually. Exports are expected to grow about 3.7 percent annually between 1991 and 1995.

As supply and demand in the world bulk carrier trades approach equilibrium, conditions will continue to improve. U.S.-flag bulk vessels are not generally active in the international market, except on subsidized routes, because of their high operating costs.

DOMESTIC SHIPPING

Section 27 of the Merchant Marine Act of 1920, known as the Jones Act, requires all waterborne commerce between points in the United States, including its territories and possessions, to be carried on vessels built and documented in the United States and owned by U.S. citizens. Domestic shipping operations consist of the domestic oceanborne trades (coastal, intercoastal, and noncontiguous trade with Alaska, Hawaii, Puerto Rico, the Virgin Islands, and Guam), including the service boat industry; Great Lakes movements; and the inland waterways trades.

Summary information on the volume of cargoes carried and revenues earned is contained in Table 12. During 1988, the U.S. domestic water transportation industry carried more than 1 billion short tons of cargo and earned $6.7 billion in revenues. Preliminary figures for 1989 indicate cargo approached 1 billion tons.

Deep Sea Domestic Transportation

In 1988, the deep sea domestic industry (SIC 442) carried 330 million short tons of domestic waterborne cargo. Movements of crude petroleum and petroleum products accounted for 83 percent of the 1988 tonnage. Preliminary estimates for 1989 indicate a decrease of 9 percent, to 300 million short tons (Table 12). This small decrease is due to a decline in the volume of waterborne crude oil traffic that followed a decline in Alaska North Slope (ANS) crude oil production from 1,974,000 barrels per day (b/d) in 1988 to 1,832,000 b/d in 1989. Increased consumption of ANS crude oil on the West Coast and the opening of a new crude oil pipeline from the West Coast to Midwest refineries also contributed to the decline.

As of April 1, 1990, 163 vessels, totalling 9.3 million DWT, were operating in domestic ocean trade (Table 4). There were 93 domestic ocean vessels (3.8 million DWT) employed in the coastal trade, and another 70 vessels (5.5 million DWT) were operating offshore in the noncontiguous trades.

Tankers make up the largest segment of the domestic fleet. There were 130 U.S.-flag tankers and oceangoing integrated tank barges, totaling 8.5 million DWT, active in the domestic trade on April 1, 1990. Domestic tankers and oceangoing integrated tank barges carried approximately 253 million short tons of crude oil, petroleum products, and chemicals during 1988. This represents a decrease of almost 12 percent from 1987.

The deep sea domestic liner fleet consisted of 24 active vessels, totalling 494,000 DWT. One vessel was operating in coastal service, with the balance engaged offshore in the noncontiguous trades. In addition, two passenger vessels totaling 14,000 DWT were operating in the Hawaiian cruise trade.

There were seven oceangoing dry bulk ships and integrated tug/barge units, totalling 222,000 DWT, and a large number of conventional tug/barge combinations operating in the domestic trade as of April 1, 1990.

Liner cargoes and dry bulk commodities moving in the coastal trade totaled 45 million short tons during 1988. The major commodities included coal and coke (12 million short tons) and nonmetallic minerals (13 million short tons). These cargoes were carried by the deep sea domestic liner fleet, dry cargo barges, dry bulk ships, and integrated tug/barge units.

The service boat industry, which transports workers and supplies to offshore drilling rigs, recovered significantly since 1989. The industry has continued to dispose of uneconomic surplus tonnage. The U.S.-flag fleet consists of approximately 900 vessels, compared with a high of about 1,200 vessels in 1985. The primary marketplace for U.S.-flag service vessels continues to be the Gulf of Mexico, where fleet utilization is approaching full capacity. However, with the severe downturn in the U.S. offshore drilling industry in the early 1980s, many U.S.-flag service boat operators sought employment outside U.S. waters in the growing international market. Many of these vessels remain outside the Gulf.

Great Lakes Movements

The Great Lakes industry (SIC 443) lost some ground in its recovery during 1989, the result primarily of poor weather late in the navigation season and an early closing of the Sault Saint Marie locks because of icing. U.S. Great Lakes shipments totaled 110.5 million short tons during 1988. Preliminary estimates indicate a decrease to 100 million short tons in 1989 (Table 12).

Table 12: Trends in U.S. Domestic Waterborne Commerce

Trade Segment	1988		1989[1]	
	Amount	Percent	Amount	Percent
Total volume (millions of short tons)[2]	1,028	100	1,001	100
Deep sea domestic	330	32	300	30
Lakewise	110	11	100	10
Inland	588	57	601	60
Total Revenues (million $)	6,696	100	NA[3]	NA
Deep sea domestic	3,484	52	NA	NA
Lakewise	574	9	NA	NA
Inland	2,637	39	NA	NA

[1] Preliminary

[2] Excludes local shipments

[3] Not available

SOURCE: U.S. Department of the Army, Corps of Engineers, *Waterborne Commerce of the United States*; and Transportation Policy Associates, *Transportation in America*, May 1990.

The U.S. steel industry accounts for most of the Great Lakes cargo. The steel and related industries, which are heavily concentrated in the region, rely on the Great Lakes fleet for shipments of iron ore and coal. As of March 1, 1990, the Great Lakes fleet consisted of 78 vessels with a total capacity of 2.1 million DWT. The fleet included 69 bulk carriers, 3 tankers, and 6 ferries. In May 1990, 64 of these vessels were operating, representing 97 percent of available capacity.

The principal commodities carried by the U.S.-flag Great Lakes fleet are iron ore, coal, and stone. Shipments of iron ore for the steel industry totaled 57.1 million short tons during 1989, a decrease of 7 percent from 1988. Coal shipments for power generation increased 6 percent, to 19.4 million short tons in 1989. Limestone and gypsum shipments decreased from 26.4 million short tons in 1988 to 25.1 million short tons in 1989.

Inland Waterways Transportation

The inland waterways industry (SIC 444) consists chiefly of barge movements over the nation's 25,777 miles of navigable waterways. In 1989, inland waterway shipments accounted for 60 percent of all domestic waterborne com-

Table 13: Changes in Inland Barge and Cargo Movements, Three Key Areas

(thousands of short tons)

Commodity	1988			1989			Percent Change		
	Lock & Dam 25	Lock & Dam 26	Lock & Dam 52	Lock & Dam 25	Lock & Dam 26	Lock & Dam 52	Lock & Dam 25	Lock & Dam 26	Lock & Dam 52
Farm products	26,162	43,281	9,462	24,451	41,058	11,448	−6.5	−5.1	21.0
Chemicals	2,843	7,394	8,101	2,742	7,143	8,380	−3.6	−3.4	3.4
Petroleum	1,415	5,736	7,570	1,195	5,284	8,668	−15.5	−7.9	14.5
Coal	4,528	8,012	36,732	4,827	8,026	39,138	6.6	0.2	6.6
Total[1]	34,948	64,423	61,865	33,215	61,511	67,634	−5.0	−4.5	9.3

[1] Total for commodities listed

SOURCE: Waterways Journal, based on data from the U.S. Army Corps of Engineers.

merce. According to the U.S. Army Corps of Engineers, at the end of 1988 the inland waterways fleet consisted of approximately 23,200 dry cargo barges with a carrying capacity of more than 32 million short tons; nearly 3,300 liquid tank barges capable of carrying approximately 7.0 million short tons; and more than 3,240 towboats, tugs, and other workboats.

Cargo shipments increased during 1989 from the 1988 level, and freight rates were raised slightly. Demand for capacity was bolstered by a strong national economy in basic industrial sectors such as steel and chemicals. Although there is a small overcapacity of barges, new construction is being reported by almost all smaller shipyards.

In 1988, 588 million short tons of cargo moved on the inland waterways, an increase of 20 million tons from 1987. Table 13 shows tonnage for the four major commodity groups moving through Lock and Dam 25 and 26 on the Mississippi River and Lock and Dam 52 on the Ohio River. Traffic on the lower Mississippi settled down in 1989 after low water in 1988 caused a temporary decline and subsequent surge in traffic.

Outlook for 1991

In the domestic liner trade, service between Hawaii and the mainland may be expanded. The Hawaiian cruise trade will continue to be a strong segment of the domestic travel industry.

The two key trades for the U.S.-flag domestic tanker fleet will continue to be the movement of Alaska North Slope (ANS) crude oil to the lower 48 states, Alaska, and Hawaii, and the movement of refined petroleum products between the Gulf and East Coasts. Tanker shipments of Alaskan crude oil to the Gulf Coast will continue to decrease because of declining output from the Alaska North Slope oil fields, increased pipeline capacity between the West Coast and Gulf Coasts, and increased demand for crude oil by West Coast refiners. In the product trade, U.S.-flag domestic tanker operators face stiff competition from pipelines and from imported refined products.

The outlook for the Great Lakes fleet is tied to recovery in the U.S. steel industry. Iron and steel output is expected to grow a small amount in 1991 after a decline in 1990. Iron ore for the steel industry traditionally has accounted for more than half of all cargoes carried by the Lakers. Also, a significant share of the limestone (which is used to manufacture iron pellets for the steel industry) and the coal carried by the fleet is destined for steel makers. Improved demand for these commodities should result in the continuing high capacity utilization of the U.S.-flag Great Lakes fleet.

The inland waterway industry has generally overcome its problems of equipment overcapacity, weather variations, and lock maintenance, and is well on the road to recovery. The trend toward fewer companies in the industry is expected to continue, with more mergers and consolidations. Tonnage carried is projected to increase modestly by 1 percent annually in the near term.

The outlook is also good in the offshore drilling industry. Increases in offshore drilling activity are likely as long as the price of imported petroleum increases. The surplus of service vessels has decreased to the point where almost all of the available capacity is being utilized.

Long-Term Prospects

The long-term outlook for the domestic liner industry is tied closely to the national economy. Added capacity in the Hawaiian liner trade is likely to put downward pressure on freight rates. Matson Navigation Company, which operates six vessels in the mainland-Hawaii trade, has ordered a new containership scheduled to be delivered in 1992, and also purchased a roll-on/roll-off vessel from the Puerto Rico Maritime Shipping Authority. American President Lines is appealing a denial of permission to enter the trade and Sea-Land Service may expand its capacity on the route. Capacity in the domestic Alaska liner trade is expected to remain stable and no additional vessels are expected to enter the trade.

Employment of the domestic tanker fleet will continue to depend on the ANS crude oil and domestic refined product trades. The volume of waterborne trade will continue to decline as ANS production slows and alternative modes of transport are used.

Long-term prospects for Great Lakes shipping depend on the level of shipments of iron ore, coal, and limestone carried by U.S.-flag Lakers and the continuing prosperity of the steel industry in the Great Lakes region. The industries are expected to continue at high production levels unless termination of Voluntary Restraint Agreements (VRAs) in 1992, coupled with an increase in the value of the dollar, leads to increased steel imports. (The agreements limit foreign steel producers to about 20 percent of the U.S. market.) In addition, the stringent air quality standards for coke ovens in the pending Clean Air Act could force several coke batteries to close. However, the same legislation could provide impetus for the movement of Western coal by vessel from Superior, Wisconsin, to lower Lakes ports, which would require two new 1,000-foot vessels. The construction industries appear to have a continuing need for limestone, sand, gravel, and cement. Continued high utilization of the existing fleet could also lead to retrofitting of some of the remaining straight-deck bulk carriers by lengthening or installation of self-unloading equipment. (For additional information, see also chapters 1 (Metals and Industrial Minerals Mining), and 2 (Coal Mining), 7 (Construction Materials), 13 (Industrial and Agricultural Chemicals).

Average annual traffic on the inland waterways is projected to grow 1 to 3 percent between 1990 and 2000. The commodities with the highest expected annual growth rates are industrial and agricultural chemicals, farm products, and coal. New barge construction programs may be needed to satisfy expected demand, but operators must manage their programs to prevent overbuilding.—*Tom Bryan, Office of Policy and Plans, Maritime Administration, U.S. Department of Transportation, (202) 366-5484, September 1990.*

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Space Commerce

In the commercial space sector, revenues are expected to remain flat at $3.6 billion in 1991. Growth in satellite services will be offset by declines in commercial space launches and satellite manufacturing.

Space commerce includes five major areas of space-related goods and services: commercial space transportation, satellite communications, satellite remote sensing, materials research and processing in space, and space-based industrial R&D facilities. Although communications satellites have been owned and operated by private companies since 1964, commercial activity in the other areas began in the 1980s as a result of major changes in government policy to privatize space activities. Space commerce industries do not have separate SIC codes.

Before reading this chapter, please see "How to Get the Most Out of This Book" on page 1. It will clarify questions you may have concerning forecasting methodology, sources and references, and the Standard Industrial Classification system (SIC). For other topics related to this chapter, see chapters 18 (Advanced Materials: Biotechnology, Advanced Ceramics), 22 (Aerospace: Missiles and Space Vehicles), 29 (Telecommunications Services) and 31 (Radio Detection and Equipment).

Most revenues in space commerce are generated by satellite communications. After several years of rapid growth as new space markets became commercialized, revenues in the sector are beginning to level off. Yearly fluctuations in demand in the mature markets—commercial space launches and satellite manufacturing—tend to offset rapid growth in satellite services for business. Expanding markets include private satellite transmission of live news programs, networks for corporations, business television, and transmission of live news programs.

The fastest growing industry is mobile satellite services, which include vehicle tracking, voice and data communications, navigation and positioning, paging, and aeronautical communications. A privately-funded commercial R&D facility is now under construction which will fly on the NASA Shuttle twice a year beginning in 1992. This experimental laboratory, Spacehab, will lease its facilities to companies researching protein crystals, metal alloys, pharmaceuticals, and other advanced materials.

The market for small launch vehicles and launch services depends on NASA and military contracts. The remote sensing industry, which markets raw data and images of the earth's surface, also continues to rely on government support despite the Remote Sensing Commercialization Act of 1984. Companies which market data and those which market data-derived images both depend on the Government continuing to operate its two Landsat satellites.

INTERNATIONAL COMPETITIVENESS

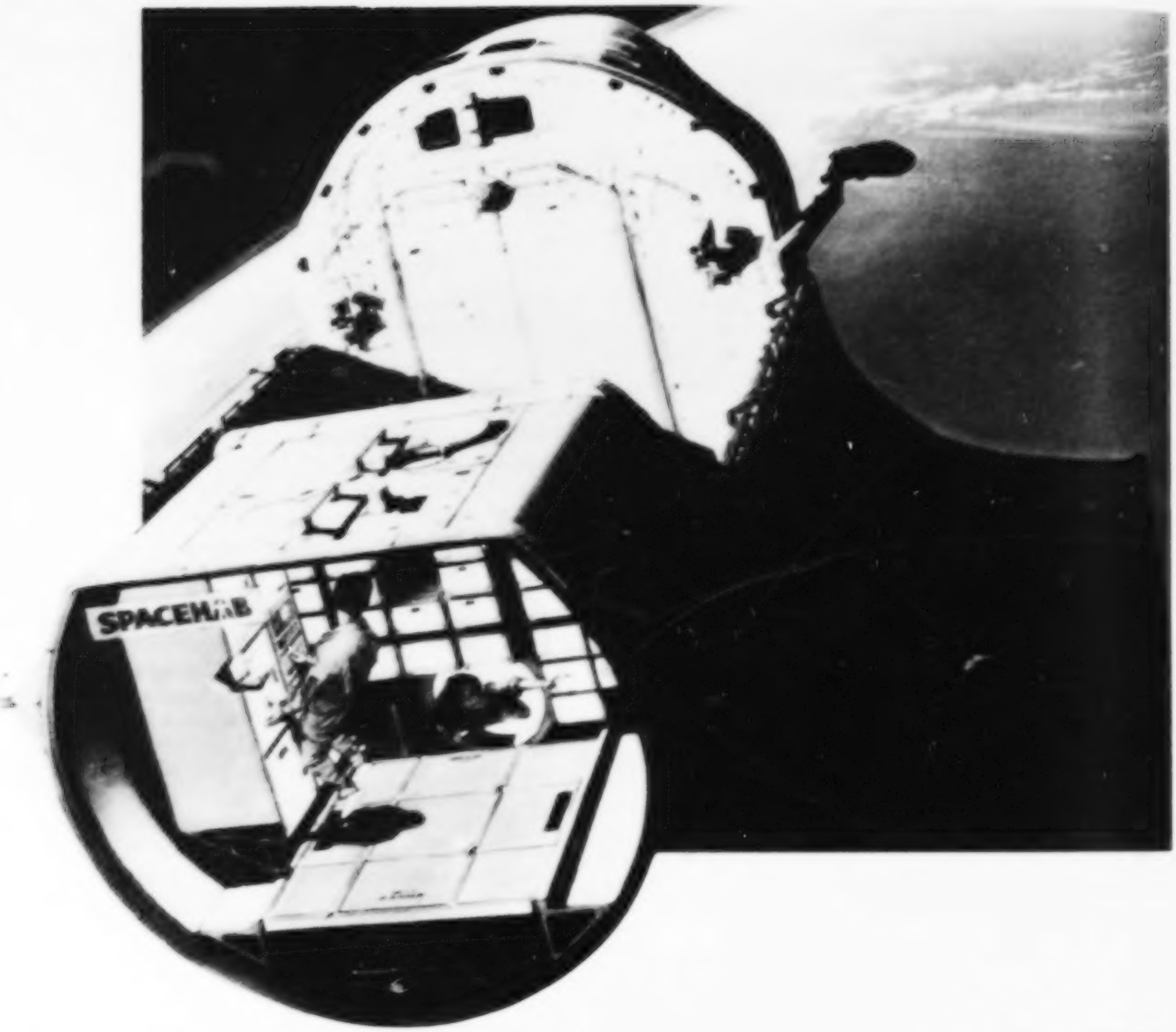
International competition is growing as the number of spacefaring nations increases. There are seven countries capable of building and launching satellites: the United States, Japan, France/Europe, the U.S.S.R., China, India, and Israel.

The primary competitor for the U.S. launch industry, which uses large capacity boosters (Atlas, Delta, Titan) to launch communications satellites, is Arianespace, a French-led European launch company. The French national space agency, CNES, owns 32 percent of Arianespace, which has about half the world market in commercial space launches, and most of the contracts for launching European satellites. Arianespace generated $630 million from 7 launches in 1989, and has scheduled 9 launches with 14 payloads in 1991. China launched a U.S.-built satellite in 1990 and has contracts for two commercial launches in 1992.

In remote sensing, the major competitor to the two-satellite U.S. Landsat system, which has 55 percent of the world market, is SPOT Image, a French company which also has two satellites. SPOT image is partly owned by CNES. Japan and India also have remote sensing satellites, but they are not active commercially. India uses its satellites to monitor crops and monsoons, and Japan to study urban land use and forests.

The U.S. satellite manufacturing industry competes for international communications satellites contracts with companies in four European nations, Japan, the U.S.S.R., and Canada. The United States share of the world market for communications satellites is about 55 percent. The U.S. is the leader in developing both new technology and new markets for mobile satellite services and for satellite navigation and tracking. Europe and Japan are developing mobile satellite communications systems based on U.S. and indigenous technologies. Because of deregulation in the telecommunications market, the U.S. is the fastest growing market in satellite services for business. These include private satellite networks for internal corporate communications, business television, and satellite newsgathering.

Pricing is a major issue in the international market for launch services. The U.S. Government started formal negotiations with the European Space Agency (ESA) in 1990 to establish disciplines on government involvement in commercial launch services, and to address issues related to new competition. In particular, the negotiations may address difficulties resulting from below-market Soviet pricing practices, which may disrupt the functioning of the market.



SPACEHAB Inc.

SPACEHAB Inc.'s pressurized orbital laboratory is the world's first privately funded, developed, and operated R&D facility in space.

Outlook for 1991

Combined revenues from all aspects of the commercial space industries are expected to level off at $3.6 billion, unchanged from 1990.

Launches

The Department of Transportation reports that the commercial space launch industry has scheduled eight launches of large capacity vehicles which will generate revenues of $450 million in 1991, compared with nine launches worth $570 million in 1990. The firms that handle small launch vehicles have contracts for 14 launches in 1991 worth $55 million, with 11 of the total classified as commercial launches. In 1990, there were four launches (three military and one commercial) of payloads using small orbital vehicles and sounding (sub-orbital) rockets which generated $27 million for small launch companies.

Manufacturing

The U.S. satellite manufacturing industry is scheduled to deliver eight communications satellites worth $900 million in 1991, compared with nine satellites worth over $1 billion in 1990. Revenues from the manufacture of earth station equipment and antennas are expected to reach $1 billion in 1991, up 18 percent from $850 million in 1990. The largest markets for fixed earth stations are business communications systems and television receive-only (TVRO) satellite dishes for residential users.

Operations

Satellite operating companies, which lease transponders (repeaters/amplifiers) on U.S. domestic satellites, will generate revenues of $850 million in 1991. Nearly 60 percent of the revenues will be generated by transmitting video for cable TV networks and the national broadcast networks.

Mobile Services

Mobile satellite services is the fastest growing segment of the satellite industry; total revenues are expected to reach $240 million in 1991, up from $145 million in 1990. Growth will come mostly from sales of receiving equipment to commercial users of the Department of Defense's Global Positioning Satellite system (GPS), which provides highly accurate worldwide positioning for navigation, highway mapping, and seismic and other surveying. Revenues from GPS equipment sales are expected to increase from $86 million to $160 million in 1991. Revenues from the other segment of the mobile services market—vehicle tracking, voice and digital messaging, paging, and aeronautical communications—are estimated at $80 million in 1991, compared with $60 million in 1990.

Table 1: U.S. Space Commerce Revenues

(in millions of dollars)

Item	1988	1989	1990[1]	1991[2]
Commercial satellites	550	900	1,050	900
Transponder leasing	600	750	800	850
Earth stations	600	750	850	1,000
Commercial launches (large capacity)	0	150	570	450
Remote sensing	90	115	140	170
Mobile satellite services	0	100	145	240
Total	1,840	2,765	3,555	3,610

[1] Revised

[2] Projected

SOURCES: Estimates by the U.S. Department of Commerce, Office of Space Commerce and Office of Business Analysis. Commercial launch estimates by the U.S. Department of Transportation, Office of Commercial Space Transportation.

Remote Sensing

The remote sensing industry is expected to continue growing at an annual rate exceeding 20 percent in 1991, with revenues of $170 million. This includes revenues from sales of unenhanced satellite data, and from consulting firms and service providers. The Landsat 6 satellite will be launched in 1991, with increased capabilities and a resolution of 15 meters, compared with 30-meter resolution of Landsats 4 and 5.

Exports

Export earnings in the space commerce sector are expected to decline to $800 million in 1991 from $1.6 billion in 1990. The number of communications satellites produced for other nations will decline from nine in 1990 to five in 1991. The U.S. launch industry will generate about $220 million from launching satellites for other countries and international organizations.

Long-Term Prospects

Manufacturing

The satellite manufacturing industry is expected to continue growing over the next five years, as most U.S. satellites serving the domestic market reach the end of their lifespans and need to be replaced. There is a possibility of excess transponder capacity in 1993, when nine domestic satellites are scheduled to be launched, and in 1994, when another five will be launched. Including international sales, the U.S. satellite manufacturing industry has 29 communications satellites scheduled for delivery in the next three years, 1991-93. In addition, a U.S. satellite company won a $1 billion contract for four satellites from INMARSAT, the international maritime satellite cooperative. They are to be delivered in 1993-95.

The market for small, low-cost satellites, called lightsats and microsats, will continue to emerge. Lightsats are satellites under 1,000 pounds, and microsats are less than 250 pounds. Over five new satellite operating companies were formed in 1990 and have applied for FCC licenses for systems using lightsats or microsats. By 1995, constellations of lightsats in low earth orbits should be capable of providing commercial services for worldwide cellular telephone service, asset tracking, auto road service and medical emergency messaging, and radio services to foreign countries.

Broadcast

Direct broadcast services should also begin commercial operation in the U.S. in the next five years. Europe and Japan already have their own domestic operating systems. Several new U.S. satellite operating companies were formed in 1990 and applied for FCC licenses for direct broadcast of cable TV programming to homes and for DBS audio, the direct national broadcast of compact disk quality radio programming to mobile units in cars.

Launching

The demand for commercial launch services will be relatively flat over the next five years. The launch companies will receive a steady flow of orders to launch U.S. Government civil and military satellites, as well as satellites from foreign countries and international organizations. International competition will increase if Japan enters the world launch market with the H-2, the large capacity booster it is now developing through its space agency NASDA. Also, the European Space Agency is developing a new generation of the Ariane launcher, the Ariane 5, which may reduce the cost per pound of payload by 20 percent. The market for small launch vehicles and launching services is expected to expand to capture some of the market for commercial lightsats, although lightsats can be launched in groups on the medium and large launch vehicles. The small launchers should also benefit from increasing interest in materials research experiments, which require short periods of microgravity available on suborbital flights.

Commercial Space Launches

Revenues in the commercial launch industry are highly sensitive to changes in launch schedules from delays in payload readiness, launch failures and subsequent investigations, and construction at launch sites. The number of launches in recent years has varied considerably, from two in 1989 to nine in 1990, and eight scheduled for 1991. The Titan 3 launch vehicle will not be used for two years because of construction problems at the launch pad at Cape Canaveral, and these launches are priced at over $100 million each. The Ariane launch schedule also is subject to unexpected changes; a launch failure in 1990 resulted in a 5-month delay until the cause was determined and preventive measures implemented. This reduced the number of Ariane launches in 1990 from the scheduled nine to only six.

Satellite Communications

Demand for satellite services by business is responsible for most of the recent growth in space commerce. More than 230

Orbital Sciences Corporation

This Pegasus rocket was developed under a contract from the Pentagon's Defense Advanced Research Projects Agency (DARPA) for putting satellites into orbit for the Department of Defense and private customers.

U.S. corporations have established private satellite networks for communications of video, voice, and data between headquarters and remote company locations at over 50,000 sites. Satellite systems are more cost effective and flexible than terrestial telephone networks linking headquarters with scattered sites over long distances. Most private satellite networks are concentrated in the retail, lodging, and automotive industries.

Lightsats and microsats are an emerging market for satellite manufacturers. This market is currently dominated by military contracts. NASA has announced it will launch two scientific lightsats a year for five years, under its Small Explorer satellite program. The date of the first launch has not been determined. The NASA lightsats range in size from 250 to 700 pounds.

The military launched 11 small satellites in 1990, at an estimated cost of $35 million. The Department of Defense budget request for small satellites, however, has been reduced to $29.7 million for 1991. Potential commercial markets for lightsats include small communications satellites (3 to 10 transponders) in geostationary orbit; and systems of 20 to 80 of them may be used commercially in lower orbits for mobile satellite services.

Mobile Satellite Services

Mobile satellite services are expanding rapidly. They include digital messaging, tracking of vehicles, and data and voice communication with mobile units. Mobile services are now operating on three frequencies (L-band, C-band, Ku-band). The largest domestic market for mobile satellite services is the interstate trucking industry, which uses vehicle-mounted equipment to track truck fleets, and for digital messaging for communications between dispatchers and drivers. In 1991 the number of trucks with satellite communications equipment will reach 16,000, up from 11,000 trucks in 1990. Satellite communications for aircraft in domestic and overseas markets are currently being implemented. Also, over 10,000 ships are equipped to receive and transmit voice and data through the INMARSAT maritime satellite system.

Another mobile technology enables navigators to determine their own positions using the Department of Defense's Global Positioning System (GPS) satellites. Ships, aircraft, vehicles, and surveyors can use the GPS constellation of satellites to determine a precise location for navigation or velocity on a worldwide 3-dimensional grid. The Air Force uses this system to keep track of its bombers. State highway departments are using GPS-equipped vehicles and portable units to update detailed road maps, and to monitor and catalog buildings along state highways. GPS is becoming a standard technology for precise surveying applications, including seismic, and for farming and emergency relief services. The commercial market for GPS receivers is expected to increase from $86 million in 1990 to $160 million in 1991.

Remote Sensing

Remote sensing is the use of cameras, radar, or other sensing devices in an orbiting spacecraft to acquire information about the earth's surface. The Landsat remote sensing satellites are built and owned by the U.S. Government and managed by the National Oceanic and Atmospheric Administration (NOAA) in the Department of Commerce. Since 1985, a private company, EOSAT, has operated the Landsat system and marketed the unenhanced data under government contracts. In 1989, worldwide revenues from the sale of Landsat data, including U.S. domestic sales, international data sales, and earth station access fees paid by foreign operators in 16 countries, were about $25 million. International sales were the fastest-growing market for Landsat data; Asia is the largest international market. By comparsion, worldwide revenues for SPOT Image, the French remote sensing system, were $22 million in 1989.

Remote sensing satellites have a variety of applications, including agricultural assessments and crop forecasts, land-use planning, oil and mineral prospecting, cartography, forestry, and environmental pollution surveys. Over 200 companies currently offer such remote sensing services as consulting, software, and systems hardware. The U.S. commercial market is expanding over 25 percent a year because of the declining cost of computers and data processing, and because mapping technology is shifting from aerial photography to remote sensing data. Satellite data cost less and are more up-to-date than aerial maps.

The industry depends on the government for funds to build and operate Landsat satellites.

Materials Processing in Space

Materials research and processing in space is still a small industry and few products are being marketed commercially, but the government has a policy of nurturing research in this area and several small firms now provide hardware and services. Experiments have been performed in space to produce unusually strong and light metals, large protein crystals, and pure pharmaceuticals. Experiments which require man-tending for periods of up to 11 days can be performed on the Shuttle. Short periods of microgravity, necessary for many such experiments, can be obtained using suborbital sounding rockets, drop towers, and parabolic aircraft flights. Microgravity experiments are the major payload for firms offering commercial suborbital rocket launches.

Nearly 100 U.S. corporations interested in materials research and processing in space are affiliated with 8 of the 16 NASA Centers for the Commercial Development of Space (CCDS), most located at universities. The CCDS concept enables firms to learn about the prospects of space materials processing at relatively low cost, and provides access to academic resources. Research in materials processing will accelerate in 1991, and NASA has increased its funding for commercial launches to carry more experiments into space. NASA is also developing return capsules for experiments that have been in orbit on satellites.

Space-based R&D Facilities

A market is developing for privately funded space infrastructure projects designed for space materials research. These projects depend on access to the Shuttle. The privately funded Spacehab has raised about $100 million for construction of a pressurized metal module for research experiments on the Shuttle, and has a contract with NASA for two flights a year at $30 million a flight. The research module has been leased to private industry, NASA, state government agencies, and foreign governments.

Commercially Developed Launch Facilities

Privately funded launch sites, or spaceports, are a recent concept. Spaceports are planned for large capacity boosters and for small suborbital sounding rockets. In 1990, the Florida Legislature established the Florida Spaceport Authority with a bonding authorization of $500 million. Hawaii is also involved in plans for a commercial spaceport. State governments are interested in spaceports partly because of spinoffs to research parks, office buildings, tourism, and space-related theme parks. Plans for a private launch facility at Cape York, Australia may affect the viability of U.S. spaceports.

Space Insurance

Insurance is essential to the development of space commerce. Space insurance includes loss of vehicle and payload, damage to government launch facilities, and third-party liability. Vehicle and payload insurance covers the value of the launch vehicle and spacecraft from launch through initial operations, and may include annual coverage for commercial operations. Third-party liability insurance is designed to cover injury or damage to parties other than those associated with the payload and vehicle during launch activities. Requirments for third-party liability and government property damage insurance are determined by the Secretary of Transportation. Rates for communications satellites, which average about $100 million in insured value, range from 16 to 20 percent of payload value. Industry sources report that the amount of insurance, or "capacity," available for a typical launch and payload is about $250 million.—*Donald Dalton, Office of Business Analysis, (202) 377-1190, August 1990.*

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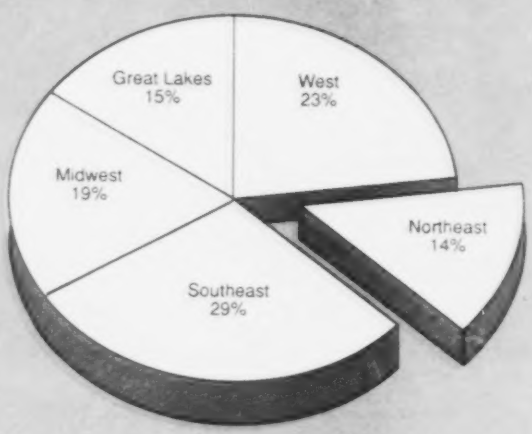
SOUTHWIND

43

Travel Services

The trend in travel spending is expected to continue in 1991, following real growth of 1.5 percent in 1990. Significant changes in the structure of the industry will continue. These changes include the development of new forms of travel lodging, the growth of alternatives to traditional means of selling travel, initiation of more effective security measures, and the passage of legislation regarding Passenger Facility Charges (PFCs). The factors that will impact negatively on travel are increased airport and highway congestion, increasing energy prices due to instability among OPEC's Middle East Nations, and increasing air fares.

Figure 43-1
Domestic U.S. Travel by Destination, 1990*



* Estimated.

Note: Based on person-trips by U.S. residents.
Source: National Travel Survey, U.S. Travel Data Center.

Travel services purchased by U.S. residents and foreign visitors while traveling in this country fall into the major categories of transportation, lodging, food and beverages, entertainment, recreation, and purchases of incidental items. These services are provided at the retail level by a variety of businesses, including U.S. airlines, intercity bus companies, Amtrak (the national passenger rail system), passenger ship and boat operators, automobile services, commercial lodging places, campgrounds and trailer parks, eating and drinking places, amusement and recreation facilities, automobile rental (without drivers), taxicab companies, travel agents, and general merchandise and miscellaneous retail stores.

Before reading this chapter, please see "How to Get the Most Out of This Book" on page 1. It will clarify questions you may have concerning data collection procedures, factors affecting trade data, forecasting methodology, the use of constant dollars, and sources and references. For other topics related to the subject of this chapter, see chapter 41 (Transportation Services).

The travel industry is a large and growing sector of the U.S. economy. The U.S. Travel Data Center, a non-profit research organization associated with the travel industry, estimates that sales from air, bus, taxi, cruise ships, and rail travel, hotel/motel accommodations, camping, eating and drinking place consumption, retail sales, and amusement and recreation services totaled $350 billion in 1989 and equaled 6.7 percent of Gross National Product. The industry is largely composed of small businesses.

Domestic Travel

Travel volume data collected through the Data Center's annual National Travel Survey show that Americans took a record 1.29 billion person-trips in 1990, a 2.2 percent increase from the previous high set in 1989. A person-trip occurs every time one person goes 100 miles or more, one way, away from home in one day, or is out of town one or more nights and returns to his origin. Travelers averaged 4.2 nights away from home in all types of lodging in 1990. Vacation travel continued to strengthen in 1990, rising 4 percent in volume over the prior year. The shift toward more weekend and "mini-vacation" travel, which tends to be shorter than average in duration, continued in 1990. The U.S. lodging industry enjoyed about a 4 percent growth in receipts in 1990.

Short-term recreational visits to America's national parks declined in 1989 and again in 1990. However, overnight stays in parks are up again in 1990 after rising 3 percent in 1989.

Travel for business purposes also remained strong. Business person-trips were up 2.5 percent and business person-nights also increased from 1989.

The cost of traveling away from home in the U.S. rose about 6.5 percent in 1990 after experiencing a 5.3 percent increase in 1989. As shown in the Trends and Forecasts table, the increase in the Travel Price Index, compiled by the U.S. Travel Data Center, was due primarily to rising lodging and entertainment costs, as well as increases in

Overnight stays in national parks, such as Big Bend National Park, shown here, are increasing.

U.S. Travel Data Center

airline fares and motor fuel prices later in the year. The Consumer Price Index for all urban consumers and all items, by comparison, was up about 5.8 percent.

INTERNATIONAL TRAVEL

Visitors to the United States

For the second straight year, travel receipts from foreign visitors, $51.3 billion, exceeded the nearly $46.5 billion in travel payments made by U.S. residents traveling abroad in 1990. The result was a travel trade surplus of $4.8 billion, up from a $1.0 billion surplus in 1989.

Foreign tourism to the United States showed substantial growth for the fifth consecutive year, with over 40.6 million arrivals in 1990, up 11.0 percent over 1989. Growth in arrivals from overseas countries has increased an average 15 percent per year over the past 5 years, while domestic travel has grown at only 3.5 percent per year. Arrivals from all parts of the world were strong, but those from Oceania, Asia, and the Middle East logged the largest increases. Travel from Asia and the Middle East was up 18 percent, with the greatest growth occurring in the Korean market, which rose almost 45 percent over 1989 arrivals. Japan is still the largest overseas market, generating over 3.3 million arrivals, although its growth rate slowed to 8 percent in 1990. Oceania saw an increase of over 13 percent. Australia alone grew by nearly 17 percent. These increases were due to the relatively weak U.S. dollar, economic health in certain other countries, and U.S. promotional efforts.

The European market saw another year of 8 percent growth, as in 1989. Spain showed the fastest individual growth rate, almost 20 percent, and Belgium grew by 16 percent. The United Kingdom, the top generator of arrivals to the U.S. from Europe, grew by 7 percent, reaching almost 2.4 million visitors. Germany rebounded from its 1 percent decline last year to show a 6 percent increase in the

Trends and Forecasts: Travel Services for U.S. Citizens Traveling in the U.S.

						Percent Change				
						Compound Annual		Annual		
Item	1987	1988[1]	1989[1]	1990[2]	1991[2]	1982-91	1987-91	1988-89	1989-90	1990-91
Expenditures ($ billions)	299.9	322.9	350.0	377.3	403.7	9.0	7.7	8.4	7.8	7.0
Employment (millions)	5.49	5.65	5.83	5.90	5.95	4.6	2.0	3.2	1.2	0.8
Travel Price Index (1982-1984=100)	114.9	119.5	125.8	134.0	142.0	4.5	5.4	5.3	6.5	6.0

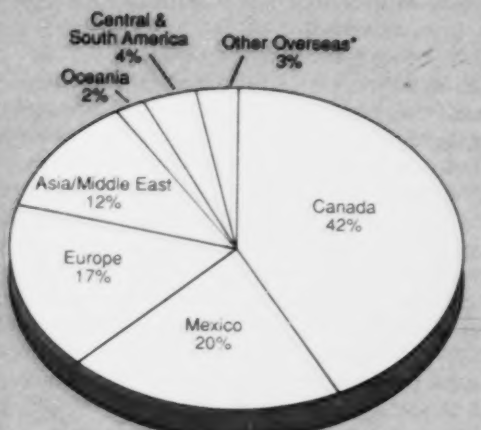
[1] Estimate.

[2] Forecast.

SOURCE: National Travel Survey of U.S. Travelers in the U.S., U.S. Travel Data Center.

Figure 43-2

Sources of U.S. Foreign Visitors, 1991



* Caribbean, Africa.

Source: U.S. Department of Commerce, U.S. Travel and Tourism Administration.

number of travelers to the U.S. in 1990. France had a 12 percent increase.

Tourism from the north and south also grew steadily. Canadian arrivals reached a new record, increasing another 12 percent in 1990 to bring the number of visitors to over 17 million. While Canadian visits still represent the largest share of foreign travel to the U.S., more than 40 percent, the percentage has been gradually declining.

Mexican travel to the U.S. showed strong growth, reversing the 6 percent decline registered in 1989. An 11 percent increase carried Mexican arrivals to almost 8 million, or 20 percent of the total arrivals to the U.S. in 1990. This increase was in large part due to growing investment along the northern Mexico border by Japanese and American manufacturers. The assembly plants that have been built there have created employment and boosted incomes, enabling Mexicans to visit the United States.

Arrival projections for 1991 show continuing growth, slightly slowed from previous years. Estimates indicate that more than 44.1 million foreign travelers will visit the country. Canada will generate 18.8 million arrivals, and Mexico will send 8.8 million. Travel from overseas regions will reach 16.5 million. Travel receipts will reach $58.3 billion dollars in 1991.

U.S. Citizens' Foreign Travel

Travel abroad by U.S. citizens saw modest gains in 1990. In 1988 the rate of growth was 3 percent; in 1989, it was 1 percent. Total departures in 1990 increased to 44.1 million, a 6 percent increase over 1989.

Travel to Mexico, which continues to be relatively inexpensive for Americans, showed a strong 9 percent growth in 1990. Mexico continued to outpace Canada as the number one destination for U.S. travelers; it had almost 15.6 million U.S. visitors. Overseas travel also saw increases of 7 percent, despite the slow recovery of the recently weak U.S. dollar in destinations favored by U.S. travelers. Growth was also strong in travel to Central America and Asia. U.S. travel to Canada rebounded from its 1989 decline to a growth rate of just over 1 percent, reaching 12.8 million travelers.

EC92

The impact EC92 will have on the U.S. travel industry is unknown. U.S. business travel to Europe will probably increase because of increased opportunities in Europe and increased U.S. involvement with European business partners worldwide. The European Community, through its EC92 program, is integrating the markets of its 12 members states. The resulting single market will consist of 325 million people with a Gross Domestic Product of $4.5 trillion and a per capita income of about $14,000. Although the process of integration will continue after 1992, the EC member states are already increasing competition in the world market. More activity related to international route planning may increase travel flows between the United States and Europe.

Travel and tourism will be further facilitated by trade, investment, and tourism agreements in effect or under consideration between the United States and Eastern European countries. The United States now has bilateral tourism agreements with Poland, Hungary, and Yugoslavia, and is negotiating one with the U.S.S.R. These agreements, along with other trade and investment agreements, will help reduce travel barriers and facilitate business and investment in tourism. If the dollar continues to fall, the United States will be a travel bargain for Europeans. Even so, every year U.S. citizens break a record for outbound travel.

MODES OF TRANSPORT

Public transportation accounted for nearly 25 percent of travel expenditures in 1989, and auto transportation accounted for 15 percent. The various modes of transport experienced different growth rates. While demand is generally healthy for all modes, competitive strains have resulted from deregulation and changes in the carrying capacity of transportation companies, due to industry consolidation. This trend will continue into the 1990s, as small operators continue to be either driven out or absorbed by larger, more financially stable organizations trying to improve their own competitive positions. The performance of each transportation mode is outlined below.

Air

U.S. scheduled airlines carried over 440 million passengers in 1990. Domestic traffic was up slightly in 1990, after decreasing 0.6 percent in 1989. International travel on U.S. scheduled airlines was up 13 percent in 1990. The load factor in 1990 was about 62 percent.

Auto

Intercity vehicle-miles traveled by automobile grew in the first half of 1990 by 4.7 percent. However, unstable gasoline prices in the second half of 1990 lessened this growth rate for the entire year.

Ship

The North American cruise industry added 11,348 berths in 1990, in addition to the 31,985 berths added between 1981–1989. Demand for cruise packages rose an estimated 12 percent during 1990.

Rail and Bus

Amtrak traffic measured in passenger-miles was strong in 1990, rising 5 percent over 1989. The intercity bus industry experienced a slight decline in passenger miles in 1990 due in part to strike by employees of the country's major bus company.

Outlook for 1991

Growth in the travel industry is dependent on the U.S. economy. Since transportation expenditures accounts for approximately 40 percent of all travel spending, higher energy costs are expected to slow the growth of travel spending to its lowest rate in six years.

Foreign arrivals to the United States are expected to continue to increase steadily. In 1991, the United States is likely to keep its trade surplus in international transportation receipts. The first surplus was achieved in 1989.

Industry projections on U.S. outbound travel for 1991 indicate that growth will be slightly slower than in 1990. In 1991, total outbound travel from the United States will reach almost 45.7 million travelers. Mexico will attract more than 16.4 million U.S. travelers, Canada will attract 13.1 million, and almost 16.2 million travelers will go overseas, 7.5 million of whom will go to Europe. Overseas spending by U.S. citizens will rise to $49.4 billion in 1991.

Long-Term Prospects

Travel and tourism should show steady growth during the 1990s. The travel trade surplus is also likely to continue. Payments by outbound U.S. travelers grew by 50 percent between 1985 and 1990, while receipts from foreign visitor spending rose 129 percent.

Even though U.S. population growth will be slower in the 1990s than in earlier decades, qualitative changes in U.S. population will be favorable to travel. These include the aging of the population, the increase in labor force participation among women, smaller families, delayed childbearing, and higher levels of education and income. Statistically, the last two factors have been positively associated with travel.

Increasing competition will promote greater specialization within the industry. For example, lodging chains will increasingly advertise themselves as "budget," "luxury," "corporate meeting/convention," or "all-suite" hotels. The latter category represents one of the fastest growing segments of the hotel industry.

The industry is also developing products for the shorter-stay market. The growing number of working couples indicates that there are more households who are taking, or are interested in taking, short vacations because of scheduling conflicts. At the same time, an increase in the number of households without children, and the growing perception of more stress and less leisure time have contributed to the popularity of weekend or other short vacation trips. These types of trips do not require as much advance planning as the traditional two-week vacation yet still provide a respite from daily pressures.

Ski resorts, cruise lines, and even international tour companies now offer 4- to 7-day packages instead of only longer-stay options. Hotels have also targeted the short trip market by offering special weekend rates on rooms, often with breakfast and champagne brunches included. Shorter vacations will continue and shorter-stay packages will be offered in all segments of the travel industry as demographic trends continue in the 1990s.

Airlines will continue to offer more executive/business class sections, frequent flier programs, and restricted airport lounges. Airlines will increasingly seek international routes, and U.S. and foreign carriers will increasingly share codes for flights and destinations in computer reservation systems.

The increase in first-time overseas visitors will result in combination service packages such as airline-hotel and cruiseline-airline packages. The travel services industry will also produce combination service packages for repeat overseas travelers and for domestic travelers, including airline-rental car and hotel-rental car packages.

As the trend toward traveling with family and traveling for a combination of business and pleasure increases, the industry will accommodate those mixed needs.

As advertising grows more expensive, governments at all levels and private sector travel businesses will expand their joint advertising efforts through regional promotional organizations.

In the airline industry, important issues include terrorism, weather, congestion of the skyways, and other safety, security, and infrastructure issues. Increased attention to the design of airports, greater vigilance at check-in areas and new types of sensing devices at airports and on airplanes will help remedy safety, weather, and air traffic control problems. Growing consumer concern about flight safety and delays is expected to bring some form of congressional action.

Airlines are upgrading their fleets in response to concerns about safety and poor fuel efficiency. In October 1990, United placed the largest order in history for new jets—$22 billion. The 128 planes will be delivered between 1995 and 1998.

Due to deregulation and the resulting increased competition, travel services will be sold in different ways. Travel agents will encounter more direct selling by suppliers seeking to avoid commission payments.

During the next decade, the industry will continue to be restructured. Those changes, however, are not likely to significantly retard growth in consumer demand.—*Ron Erdmann, U.S. Travel and Tourism Administration, U.S. Department of Commerce, (202) 377-4028; and Margaret Amein and David A. Cruz, U.S. Travel Data Center, (202) 293-1040, September 1990.*

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Health and Medical Services

Expenditures on health care (SIC 80) in the United States are expected to rise 12 percent to $756.3 billion in 1991, and to increase 12 to 15 percent annually during the next 5 years. Some of the recommendations of the Commission on Comprehensive Health Care in the United States will be adopted. The health care industry will employ about 10 percent of the working population by the end of the decade.

Before reading this chapter, please see "How to Get the Most Out of This Book" on page one. It will clarify questions you may have concerning data collection procedures, forecasting methodology, sources and references, and the Standard Industrial Classification (SIC) system. For other topics related to this chapter, see chapter 46 (Medical and Dental Instruments and Supplies), and 45 (Drugs).

The primary health and medical services include public and private health care institutions such as hospitals, offices and clinics of medical doctors and other health care professionals, nursing homes, other specialized health care facilities, and managed care.

The structure of the health care services is varied, ranging from thousands of independent medical practices and partnerships to large public and non-profit institutions and private corporations. The revenues of some of these corporations run into billions of dollars and they employ tens of thousands of employees.

HEALTH CARE EXPENDITURES

The nation's health care (SIC 80) sector outlays approached 2.4 percent of the Gross National Product in 1990 Total health care expenditures rose 11.9 percent from the 1989 level to an estimated $675.7 billion in 1990, or about $2,660 per capita. Private sector health care expenditures were about 59 percent of the total, while the public sector spent 41 percent.

Although other institutions are gaining market share rapidly, hospital care is still the dominant category of health care costs. Hospital care expenditures in 1990 rose by 10.5 percent to an estimated $257.2 billion and accounted for 38.1 percent of all health care costs. Physicians services, the second largest item, rose 12.2 percent to about $131.9 billion, while expenditures for nursing home care, the third largest sector, gained 13 percent to an estimated $54.1 billion. Combined expenditures for dental services, other professional services, and other health services reached an estimated $76.4 billion.

There are many factors contributing to the rising cost of health care. They include: the cost of sophisticated but expensive technology; innovative but costly treatment of some illnesses such as heart disease, AIDS and cancer; the increasing numbers and longevity of the elderly population, who have a great need for health care services; and health care related to alcohol and drug abuse.

Some negative factors affecting rising costs are waste, fraud, malpractice and limited effective competition. De-

Trends and Forecasts: Health and Medical Services (SIC 80)

(in billions of dollars except as noted)

Item	1987	1988	1989[1]	1990[2]	1991[3]	Percent Change 1987-88	1988-89	1989-90	1990-91
TOTAL EXPENDITURES	492.5	544.0	604.1	675.7	756.3	10.5	11.0	11.9	11.9
Health services and supplies	475.2	524.1	583.5	653.0	731.3	10.3	11.3	11.9	12.0
Personal health care	436.7	480.0	530.7	589.4	657.1	9.9	10.6	11.1	11.5
Hospital care	193.8	211.7	232.8	257.2	285.7	9.2	10.0	10.5	11.1
Physicians' services	93.0	105.1	117.6	131.9	148.3	13.0	11.9	12.2	12.4
Dentists' services	27.1	29.4	31.4	33.8	36.5	8.5	6.8	7.6	8.0
Other professional services	21.2	23.8	27.0	30.7	35.0	12.3	13.4	13.7	14.0
Home health care	4.1	4.5	5.4	6.5	7.5	9.8	20.0	20.4	15.4
Drugs and other medical nondurables	38.7	41.5	44.6	48.0	51.7	7.2	7.5	7.6	7.7
Vision products and other medical durables	10.7	12.0	13.5	15.3	17.4	12.1	12.5	13.3	13.7
Nursing home care	39.8	42.8	47.9	54.1	61.4	7.5	11.9	12.9	13.5
Other personal health care	8.3	9.3	10.5	11.9	13.5	12.0	12.9	13.3	13.4
Program administration and net cost of private health insurance	23.9	27.9	35.3	44.6	53.5	16.7	26.5	26.3	20.0
Government public health activities	14.7	16.2	17.5	19.0	20.7	10.2	8.0	8.6	8.9
Research and construction	17.3	19.8	20.6	22.7	25.0	14.5	4.0	10.2	10.1
Research[4]	9.0	10.3	11.0	12.2	13.5	14.4	6.8	10.9	10.7
Construction	8.2	9.5	9.6	10.5	11.4	15.9	1.5	9.4	8.6

[1] Preliminary.

[2] Estimate.

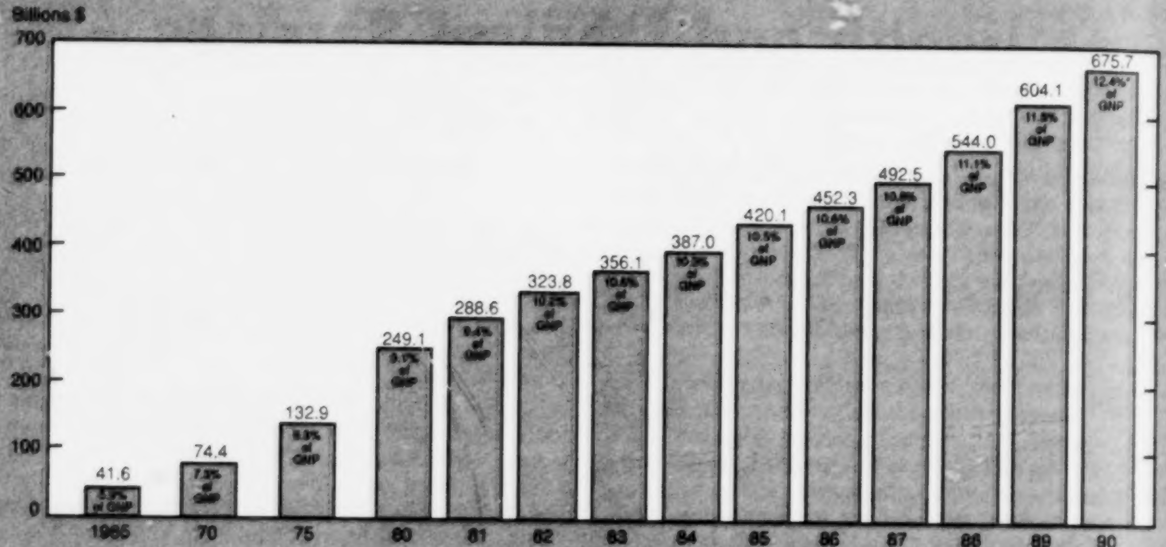
[3] Forecast.

[4] Research and development expenditures of drug companies and other manufacturers and providers of medical equipment and supplies are excluded from "research expenditures," but they are included in the expenditure class in which the product falls.

NOTE: Numbers may not add to totals because of rounding.

SOURCE: Health Care Financing Administration, Office of the Actuary. Estimates and forecasts by U.S. Department of Commerce, International Trade Administration.

Figure 44-1
National Health Care Expenditures and Percent of GNP



* Estimated by U.S. Department of Commerce, International Trade Administration.

Source: U.S. Department of Health and Human Services, Health Care Financing Administration.

spite persistent efforts by business, government and the health care industry to contain costs, growth of medical care spending continues to outpace the growth of the Gross National Product.

Reaction to Rising Costs

Rising health care costs and basic changes in the health care marketplace have caused U.S. companies to reassess the health care benefits they provide to their employees. Specifically they are reassessing who should be covered and what kind of health care services they should get.

In order to reduce health insurance coverages, some companies have been limiting the number of people covered by their plans, hiring temporary or part-time workers, who receive no health benefits, and limiting or eliminating retiree and dependent coverage. In addition, companies are asking employees to pay a larger share of health care costs. Small firms are less likely to offer health insurance coverages. Only 46 percent of businesses having fewer than 10 employees offer any health coverages.

HOSPITALS

The number of U.S. hospitals and beds has remained virtually stable since 1981. The number of hospitals declined from 6,736 in 1981 to 6,731 in 1987, while beds went from 1,145,245 to 1,137,853. Short-stay hospitals declined in number, but they had more beds than in 1981. Conversely, psychiatric hospitals increased but had fewer total beds than in 1981. Small hospitals that have higher costs per case were hardest hit by closures. Hospital inpatient services declined partly due to the increase in alternative sites of care and to cost containment efforts, such as finding acceptable alternatives to surgery.

Hospital Revenue

Total hospital revenue increased from $157.2 billion in 1984 to $211.8 billion in 1988, a 7.7 percent average annual increase. The Government contributed about 54 percent of the overall hospital revenues while private health insurance, out-of-pocket and non-patient revenues contributed the remaining 46 percent. These percentages remained fairly stable from 1984 through 1988.

The mix of hospital revenue by types of services has changed. Outpatient services—which were only 12.5 percent in 1980—rose to 21 percent in 1989. The trend in medical practice is toward more procedures for outpatient health care. The trend is partly due to pressures on health care institutions to contain costs. The new procedures do not require hospitalization and lend themselves more naturally to the outpatient programs.

Other hospital revenues from philanthropists, government grants, interest on endowments, and from services and concessions, grew at an average annual rate of 11.3 percent since 1983.

U.S. Hospital Management Overseas

Internationally, 11 U.S. hospital companies had invested in, or owned and operated 116 hospitals with 12,561 beds

Table 1: Hospital Revenue by Payment Source

(in billions of dollars)

Payment Source	1984	1988
Total government	$ 84.9	$115.2
Medicare	45.3	58.3
Medicaid	14.3	20.2
Other government	25.3	36.7
Private health insurance	56.9	75.0
Out-of-pocket	8.1	11.3
Non-patient revenue	7.3	10.3
Total	157.2	211.8

SOURCE: Health Care Financing Administration, Office of the Actuary, Office of National Cost Estimates 1989.

in 17 countries in 1988. These companies also managed 24 hospitals with 5,065 beds.

During the past decade, Japanese private and public administrators of health care have been consulting U.S. health care corporations and government health care experts. The U.S. Department of Commerce and private U.S. corporations have made frequent presentations on the industry to Japanese health care administrators.

The Japanese Government has shown keen interest in learning more about U.S. health care. At the same time, the Japanese External Trade Organization has organized health care trade fairs to help promote export of U.S. health care services to Japan. While these exchanges illustrate the potential for U.S. investments, they are not producing any meaningful sales because the Japanese health care laws still act as deterents against foreign investments.

Discussions between U.S. and Japanese officials in the health care field and the industry's written reports indicate that the health care market in Japan is especially promising for U.S. firms. There are opportunities in licensings and joint ventures for hospital planning, construction and management services; nursing home planning, construction and management services; home health care services, and medical information services.

Other U.S. investments that show promise in Japan are computer software for hospital management and diagnosis; institutional catering services; home food services for patients, and health insurance.

Although a few U.S. firms have established themselves in Japan by these licensing or joint venture arrangements, they are not directly related to the ownership, management and delivery of health care services.

MANAGED HEALTH CARE

Managed health care, a system of providing prepaid plans of comprehensive coverage to voluntarily enrolled members, continues as the growth leader in the health care industry. The system now provides coverage to about 40 percent of the insured employees compared to 3 percent in the 1970s. The latest growth figures show that managed health care enrollment increased from 59.2 million in 1989 to a new high of over 65 million in 1990.

The two predominant types of managed health care programs are Preferred Provider Organizations (PPOs) and Health Maintenance Organizations (HMOs). A growing number of employers, including the U.S. Government, are finding these managed health care programs an efficient way to control their health care insurance costs.

Federation of American Hospitals

Managed health care enrollment increased from 59.2 million in 1989 to a new high of over 65 million in 1990.

Managed health care typically covers professional fees, hospital services, diagnostic services, emergency health care services, limited mental health services, medical treatment for drug or alcohol abuse, home health services, and preventive health care.

Health Maintenance Organizations (HMOs)

The number of HMO plans decreased from 607 in 1988 to 575 in 1989, but enrollees increased from 31.9 million to 33.1 million in 1989 due to increased efforts by employers who preferred these plans. In 1991 HMO enrollment is expected to reach 37 million, a clear indication that the HMOs have become an established health care option. The decline in the number of HMO plans is due to mergers, consolidations and terminations (Table 2).

Table 2: Growth in the Number of and Enrollment in HMOs, 1986 to 1991

Year	Number of Plans	Enrollment (in millions)
1985	480	21.1
1986	626	25.8
1987	650	29.3
1988	607	31.9
1989	575	33.1
1990	NA	35.5*
1991	NA	37.4*

*Estimate by U.S. Department of Commerce.

SOURCE: Prospective Payment Assessment Commission.

In 1989, 166 HMOs served about 1.4 million Medicare beneficiaries. The number of Medicare enrollees in HMOs rose by only 4.6 percent from 1988 to 1989 because many physicians were dissatisfied with the existing Medicare payment formula.

About two-thirds of current HMOs are for-profit. In addition, more than half of all HMO enrollees are members of a plan sponsored by a national firm. HMOs may be owned by HMO management companies, insurers, multihospital companies, corporations or consulting firms.

Preferred Provider Organizations (PPOs)

Preferred Provider Organizations (PPOs) are a modified version of HMOs. PPO enrollees are offered incentives to limit their provider selection to preferred providers (Table 3). The number of plans increased from 115 in 1984 to 691 in 1988, and declined slightly to 685 in 1989. However, the number of employees enrolled has increased steadily from 12.2 million in 1987 to 26.1 million in 1989. At the same time the number of eligible family members of those employees has increased from 28.0 million in 1987 to 60.1 million in 1989.

Table 3: Number of PPOs, Employees and Eligibles

	Number of PPOs	Number of Employees (million)	Total Eligibles Members (million)
1984	115	NA	NA
1985	334	NA	NA
1986	415	NA	NA
1987	692	12.2	28.0
1988	691	18.3	42.2
1989	685	26.1	60.1

SOURCE: American Association of Preferred Provider Organizations.

MEDICARE

Medicare, as a Federal program, pays hospitals and other medical providers for serving patients aged 65 years and older, certain disabled people, and most persons with end-stage kidney disease. There are about 33 million Medicare enrollees, including more than 3 million disabled.

Medicare consists of two basic programs, hospital insurance (HI) and supplementary medical insurance (SMI). Total Medicare outlays are projected to rise from $107.2 billion in 1990 to $116.8 billion in 1991, an 9.0 percent increase.

HI under Medicare is funded primarily by Social Security payroll taxes. HI pays for care provided by hospitals, skilled nursing facilities, home health agencies and hospices. HI outlays totaled about $63.9 billion in 1990, an increase of $5.7 billion over 1989.

SMI outlays grew from $38.3 billion in 1989 to $43.4 billion in 1990, a 13.3 percent rise. SMI pays for physician services, hospital inpatient and laboratory service, treatment for end-stage disease, and durable medical equipment. Enrollees pay about 35 percent of SMI costs through premiums, but a subsidy from general revenues finances the bulk of the SMI program. In response to the projected increase in Medicare expenditures, the Administration's 1991 budget reduced spending by $5.1 billion in 1991, and another $5 billion during the next four years. These savings will affect both parts of HI and SMI while premiums for HI and SMI will increase.

Long-Term Care

Most long-term care services are provided to the elderly because of their high risk for chronic illness. About 60 percent of those receiving long-term care services are elderly. An estimated 7 million require continuous assistance in performing daily functions. In addition, many of the chronically disabled require intensive medical care, sometimes including around-the-clock nursing care.

Table 4: Medicare Estimated Outlays

(in billions of dollars)

	1989	1990	1991	Percent Change 1990–1991
Hospital insurance	$58.2	$ 63.9	$ 67.5	5.6
Supplementary Medicare insurance	38.3	43.4	49.3	13.6
Total Medicare outlays	96.6	107.2	116.8	9.0
Premium collected (SMI)	11.6	11.6	11.9	2.6
Net Medicare outlays	84.9	95.6	104.9	9.7

SOURCE: Congressional Budget Office estimates as of March 1990.

The National Institute on Aging

About 60 percent of those receiving long-term health care are elderly.

Some long-term care is provided in hospitals and nursing homes. In addition, the elderly may receive non-institutional long-term care, such as home care, homemaker services, occupational, physical, and speech therapy, adult day care, respite care, and nutritional and health education.

Between 1988 and 2003, long-term care spending for nursing home services and home care services is expected to increase twice as quickly as rate of growth of the number of persons receiving these services. In 1988 about 100 companies offered long-term care insurance plans that covered about 1.1 million people.

Private long-term insurance has restrictions that severely limit the beneficiary's ability to collect benefits, such as conflicts with prior hospitalization coverage or the lack of adjustments for inflation. The Health Insurance Association of America has reported that policies introduced in 1988 are less restrictive. However, the average premium for plans introduced in 1988 was over $300 per year for a 50-year-old; about $800 for a 65-year-old and nearly $2,800 for a 79-year-old.

The Pepper Commission

In 1988 Congress created the U.S. Bipartisan Commission on Comprehensive Health Care for All Americans (Pepper

Table 5: Long-Term Spending and Utilization 1988–2003

Payment Source/Utilization	1988	2003
Nursing Home Service		
Source ($ billions)[1]		
Medicare	0.5	1.8
Medicaid	11.6	25.0
Beneficiary out-of-pocket	17.3	35.3
Total	29.4	62.1
Utilization (millions of individuals)		
Admissions	0.9	1.3
Average daily census	1.2	2.1
Home Care Services		
Source ($ billions)[2]		
Medicare	2.1	3.5
Medicaid	1.3	2.4
Other payers	0.9	2.3
Beneficiary out-of-pocket	1.8	3.8
Total	6.1	12.0
Utilization (millions of individuals)		
Users	3.4	3.9

NOTE: Projections for aged population only.

[1] Nursing home estimates in 1988 column are based on 1987 data.

[2] 1989 dollars.

SOURCE: The Brookings Institution/ICF, Long-term Care Financing Model, unpublished estimate, 1989.

Commission) to study and recommend solutions to some major health care issues. For example, the Commission sought to provide for the 31 million Americans who have no health care insurance, and to create a long-term care system.

The Commission recommended a plan for increasing Federal health care expenditures by about $66 billion annually. The plan would require most employers either to provide health insurance to their workers or pay a tax into an insurance fund. The Commission also suggested overhauling the nation's private insurance system and restructuring the Medicaid program.

ALCOHOL ABUSE

Alcohol abuse and alcoholism are among the major health care problems in the United States that significantly increase health care costs. Alcohol is directly or indirectly responsible for about 100,000 deaths a year. The most common causes of deaths from alcohol abuse are cirrhosis and related diseases of the liver, which alone kill more than 10,000 people annually. Other problems directly related to excessive alcohol consumption are psychiatric illnesses, and neurological, nutritional and cardiac diseases.

Alcohol abuse also contributes to raising the incidences of several types of cancer, pneumonia, diabetes, and hypertension. On the nations streets and highways, about half of all motor vehicle accidents and deaths are attributed to alcohol abuse.

MEDICAL INNOVATION AND TECHNOLOGY

The expansion of sophisticated medical technology during the past two decades has greatly increased the costs of health care. One argument in favor of advanced technology is that it can diagnose and detect illnesses at an early stage and consequently improve peoples' health.

Nuclear medicine, ultrasonic devices, and other new and sophisticated equipment are widely used but are expensive. For instance, providing dialysis treatments for an end-stage kidney disease patient costs over $25,000 annually. The capital investment for a magnetic resonance imaging (MRI) unit in a hospital is about $3 million. Lithotripsy equipment costs about $2 million. Despite the high capital of purchasing and operating this equipment, the number of hospitals and clinics offering innovative treatment continues to grow. Because of competitive pressures, both doctors and patients will gravitate to better equipped facilities.

EMPLOYMENT

Health care is a leading employment sector in the economy. Its employment rose steadily from 6.8 million in 1987 to 7.6 million in 1989, an average annual increase of 5.9 percent. Preliminary data indicated that the number of health care employees would exceed 8.2 million by July 1990.

The highest growth rate occurred in the offices of physicians and surgeons where employment grew from 1,042,300 in 1987 to 1,206,800 in 1989, a 7.6 percent average annual increase. Hospital employment has been increasing steadily from 3,143,000 in 1987 to 3,490,700 in 1989. Although nursing homes and home health agencies are affected by shortages of skilled health care employees, a general upward employment trend continues as new employees gradually enter that sector. The number of employees for nursing homes and home health agencies has increased from 1,285,300 to 1,384,200, from 1987 to 1989.

Outlook for 1991

The nation's health care expenditures in 1991 will rise to about $756.3 billion. Outlays for hospital care are expected to increase 11.1 percent to $285.7 billion. Expenditures for physicians' services will reach an estimated $148.3 billion in 1991, a 12.4 percent increase over 1990, while those for nursing home care will approximate $61.4 billion, up 13.5 percent. The health care system will continue to be restructured in response to the continuous increases in health care costs and coverage for the uninsured and underinsured.

Long-Term Prospects

Unless Congress introduces some form of cost control, health care costs will continue to rise between 12.0 percent and 15 percent per year during the next 5 years. HMO and PPO enrollments will exceed 100 million persons (not including eligible dependents) by 1995, and managed health care insurance costs will continue to increase. During this period,

Table 6: Employment by Selected Private Health Care Services and Non-Agricultural Establishments 1988–1989

Types of Establishments	Employment (in thousands) 1987	1988	1989	Annual Percent Change 1987–1989
Health services (SIC 80)	6,805.4	7,144.2	7,635.3	5.9
Office of physicians and surgeons (SIC 801)	1,042.3	1,112.0	1,206.8	7.6
Office of dentists (SIC 802)	469.7	486.3	511.6	4.4
Nursing and personal care facilities (SIC 805)	1,285.3	1,318.6	1,384.2	3.8
Hospitals (SIC 806)	3,143.0	3,300.2	3,490.7	5.4
All private non-agriculture establishments	85,190.0	88,212.0	91,874.0	3.8

SOURCE: U.S. Department of Labor, Bureau of Labor Statistics.

more recipients will be seeking treatment with high technology, which will be costly but in popular demand.

Home health care, hospice care, and care for the elderly will be more dominant. The health care industry including these alternative settings will employ about 10 percent of the U.S. labor force by the year 2000. Some of the Pepper Commission's recommendation for long-term care and health care coverage for the uninsured may be adopted.

U.S. health care firms have not been too successful in stabilizing health care costs. However, their experience and expertise gained over the past 10 years in controlling Medicare costs will continue to attract recognition and may even be adopted in some overseas markets.

As the number of aged persons in Japan grows, many U.S. nursing home companies and other health care institutions look to Japan as a potential market for U.S. health care services.

During the next five-year period, U.S. firms are expected to show increased resistance to Japanese investments in the U.S. health care market. Their reaction will be due largely to Japanese laws which prohibit foreign firms from managing or owning health care companies in Japan.—*Simon Francis, Office of Service Industries, (202) 377-0350, September 1990.*

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Drugs

The drug industry will continue to grow moderately. As more countries begin to honor U.S. intellectual property rights, foreign sales will increase. Profits will remain high relative to other U.S. industries, but higher R&D costs and growing sales of lower-priced generic drugs will have a dampening effect on profits. Cooperative ventures among major players will increase.

The drug industry (SIC 283) is made up of four primary sectors: medicinal chemicals and botanicals (SIC 2833), pharmaceutical preparations (SIC 2834), diagnostics (SIC 2835), and biologicals (SIC 2836). SIC 2833 creates the active medicinal ingredients used to formulate the finished dosage-form pharmaceutical preparations in SIC 2834.

Before reading this chapter, please see "How to Get the Most Out of This Book" on page 1. It will clarify questions you may have concerning data collection procedures, factors affecting trade data, forecasting methodology, the use of constant dollars, the difference between industry and product data, sources and references, and the Standard Industrial Classification system (SIC). For other topics related to this chapter, see chapters 18 (Advanced Materials: Biotechnology), 44 (Health and Medical Services), and 46 (Medical and Dental Instruments and Supplies).

Current-dollar drug industry shipments are estimated to have increased 11.5 percent between 1989 and 1990, to $54.9 billion. In constant dollars, the increase was 4.1 percent. Product shipments totaled $49.6 billion. Exports were valued at $5.25 billion, 19 percent above 1989, while imports reached $4.2 billion, up nearly 20 percent.

Total employment in the industry is estimated to have increased to 178,300, of whom 83,400 were production workers earning an average of $12.95 per hour. Productivity increased 3.3 percent, which contributed to an after-tax profit of about 15 percent.

Drug firms are merging and forming alliances in unprecedented numbers because the risk of going it alone is much higher than 10 years ago. Costs of R&D, marketing, and sales promotion are rising significantly. Pooling research, which tends to eliminate duplication of effort, is one way the industry is trying to reduce its costs.

Although there have been some noteworthy mergers in the industry, the trend among major players seems to be more in the direction of cooperative alliances in product development and promotion.

Mergers and other cooperative efforts will propel a few of the allied entities to the top of the world pharmaceutical market, spurring greater internationalism among drug firms in the process. As a result, there will be more licensing agreements and investments in foreign companies.

R&D grew from 12 percent of sales in 1980 to almost 17 percent in 1990, a reflection of the growing cost of the latest high-technology equipment needed to carry out such research programs as computerized molecular modeling and genetic engineering. (see chapter 18, Advanced Materials: Biotechnology).

Expenditures for R&D have spiralled to a new estimated high of $8.3 billion per year. R&D productivity has declined, however. Only 23 new drugs were approved in 1989, compared with 30 in 1985. The new drugs took an average of 10 years to gain approval, of which 6 years were spent in human clinical trials. Eighteen of the drugs had already been approved for use in foreign countries before they were approved in the U.S. Today it takes an average of 12 years and an estimated $231 million to develop a new drug and bring it to market.

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The high cost of drug research is spurring greater internationalism and licensing agreements among firms.

INTERNATIONAL COMPETITIVENESS

Major world companies cannot sustain their current level of R&D expenses and still maintain a high level of profits. As a result, the trend towards consolidation and cooperative ventures will continue. The world's top 60 drug companies spend an average of 16 percent of sales on R&D. Swiss, French, Scandinavian, and U.S. companies spend the most on R&D. Drugs launched prior to 1970 make up one third of sales worldwide.

Japan has the highest per capita consumption of drug products, followed by the United States. The United Kingdom has one of the lowest per capita consumptions.

U.S. drug firms lose as much as 10 percent of their potential world sales because of widespread piracy of product and process patents, copyrights, and trademarks. This has prompted the United States to retaliate against offending countries by raising duties on their products as much as 100 percent. Instances of piracy are expected to decline as a result.

Prospects for new overseas business are particularly bright in Eastern Europe, where most basic drug products are in

U.S. Exports and Imports
Drugs

(in millions of dollars except as noted)

SIC	Industry	1989	1990[1]	1991[2]	Percent Change 1989-90	Percent Change 1990-91
2833	Medicinals and botanicals					
	Value of exports	2,881	3,460	4,160	20.1	20.2
	Value of imports	2,336	2,800	3,400	19.9	21.4
2834	Pharmaceutical preparations					
	Value of exports	849	1,020	1,230	20.1	20.6
	Value of imports	868	1,040	1,250	19.8	20.2
2835	Diagnostic substances					
	Value of exports	671	772	890	15.1	15.3
	Value of imports	118	130	145	10.2	11.5
2836	Biological products exc. diagnostic					
	Value of exports	0.0	0.0	0.0	—	—
	Value of imports	191	220	255	15.2	15.9
	Drugs					
	Value of exports	4,401	5,252	6,280	19.3	19.6
	Value of imports	3,513	4,190	5,060	19.3	20.5

[1] Estimate. [2] Forecast.

SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA). Estimates and forecasts by ITA.

Trends and Forecasts: Drugs (SIC 283)

(in millions of dollars except as noted)

Item	1987	1988[1]	1989[2]	1990[2]	1991[3]	Percent Change 1987-88	Percent Change 1988-89	Percent Change 1989-90	Percent Change 1990-91
Industry Data									
Value of shipments[4]	39,263	44,404	49,224	54,895	—	13.1	10.9	11.5	—
2833 Medicinals & botanicals	3,350	4,150	4,490	4,850	—	23.9	8.2	8.0	—
2834 Pharmaceutical preps	32,094	36,448	40,562	45,480	—	13.6	11.3	12.1	—
2835 Diagnostic substances	2,205	2,112	2,290	2,482	—	−4.2	8.4	8.4	—
2836 Bio prod ex diagnostic	1,614	1,693	1,882	2,083	—	4.9	11.2	10.7	—
Value of shipments (1987$)	39,263	41,731	43,432	45,212	47,086	6.3	4.1	4.1	4.1
2833 Medicinals & botanicals	3,350	3,963	4,240	4,541	4,865	18.3	7.0	7.1	7.1
2834 Pharmaceutical preps	32,094	34,020	35,210	36,442	37,715	6.0	3.5	3.5	3.5
2835 Diagnostic substances	2,205	2,065	2,202	2,348	2,509	−6.3	6.6	6.6	6.9
2836 Bio prod ex diagnostic	1,614	1,683	1,781	1,880	1,997	4.3	5.8	5.6	6.2
Total employment (000)	172	174	176	178	181	1.2	1.1	1.1	1.7
2833 Medicinals & botanicals	11.6	11.4	11.7	11.6	11.8	−1.7	2.6	−0.9	1.7
2834 Pharmaceutical preps	132	135	136	138	140	2.3	0.7	1.5	1.4
2835 Diagnostic substances	15.4	14.5	14.8	15.0	15.1	−5.8	2.1	1.4	0.7
2836 Bio prod ex diagnostic	13.3	13.2	13.4	13.7	13.7	−0.8	1.5	2.2	0.0
Production workers (000)	79.6	81.4	82.3	83.4	83.7	2.3	1.1	1.3	0.4
2833 Medicinals & botanicals	6.1	6.2	6.2	6.4	6.3	1.6	0.0	3.2	−1.6
2834 Pharmaceutical preps	59.9	61.6	62.2	62.7	62.9	2.8	1.0	0.8	0.3
2835 Diagnostic substances	6.8	7.3	7.6	8.0	8.1	7.4	4.1	5.3	1.2
2836 Bio prod ex diagnostic	6.8	6.3	6.3	6.3	6.4	−7.4	0.0	0.0	1.6
Average hourly earnings ($)	12.22	12.73	12.82	12.95	—	4.2	0.7	1.0	—
2833 Medicinals & botanicals	15.32	16.09	16.37	16.82	—	5.0	1.7	2.7	—
2834 Pharmaceutical preps	12.42	12.98	13.25	13.58	—	4.5	2.1	2.5	—
2835 Diagnostic substances	10.74	10.99	11.25	11.70	—	2.3	2.4	4.0	—
2836 Bio prod ex diagnostic	8.87	9.02	9.16	9.25	—	1.7	1.6	1.0	—
Capital expenditures	1,749	2,057	—	—	—	17.6	—	—	—
2833 Medicinals & botanicals	115	151	—	—	—	31.3	—	—	—
2834 Pharmaceutical preps	1,471	1,732	—	—	—	17.7	—	—	—
2835 Diagnostic substances	93.5	87.2	—	—	—	−6.7	—	—	—
2836 Bio prod ex diagnostic	69.9	87.0	—	—	—	24.5	—	—	—
Product Data									
Value of shipments[5]	35,283	39,857	44,384	49,605	—	13.0	11.4	11.8	—
2833 Medicinals & botanicals	4,224	4,991	5,403	5,863	—	18.2	8.3	8.5	—
2834 Pharmaceutical preps	26,610	30,018	33,670	37,920	—	12.8	12.2	12.6	—
2835 Diagnostic substances	2,683	2,881	3,125	3,400	—	7.4	8.5	8.8	—
2836 Bio prod ex diagnostic	1,765	1,967	2,186	2,422	—	11.4	11.1	10.8	—
Value of shipments (1987$)	35,283	37,435	39,240	41,096	43,041	6.1	4.8	4.7	4.7
2833 Medicinals & botanicals	4,224	4,782	5,116	5,485	5,870	13.2	7.0	7.2	7.0
2834 Pharmaceutical preps	26,610	27,881	29,051	30,215	31,424	4.8	4.2	4.0	4.0
2835 Diagnostic substances	2,683	2,817	3,005	3,211	3,430	5.0	6.7	6.9	6.8
2836 Bio prod ex diagnostic	1,765	1,955	2,068	2,186	2,317	10.8	5.8	5.7	6.0

[1] Advance data from the 1988 Annual Survey of Manufactures.

[2] Estimate.

[3] Forecast.

[4] Value of all products and services sold by establishments in the drugs industry.

[5] Value of products classified in the drugs industry produced by all industries.

SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA). Estimates and forecasts by ITA.

U.S. Trade Patterns in 1989
Drugs
SIC 283

(in millions of dollars, percent)

Exports			Imports		
	Value	Share		Value	Share
Canada & Mexico	436	9.9	Canada & Mexico	93.2	2.7
South America	170	3.9	South America	11.4	0.3
European Community	1,427	32.4	European Community	1,649	46.9
East Asia NICs	202	4.6	East Asia NICs	114	3.2
Japan	915	20.8	Japan	418	11.9
Other	1,251	28.4	Other	1,228	34.9
World Total	4,401	100.0	World Total	3,513	100.0
Top Five Countries					
	Value	Share		Value	Share
Japan	915	20.8	United Kingdom	667	19.0
West Germany	434	9.9	West Germany	521	14.8
Canada	346	7.9	Japan	418	11.9
Italy	282	6.4	Switzerland	375	10.7
Ireland	265	6.0	Bahamas	283	8.1

See "How to Get the Most Out of This Book" for definitions of the Country Groupings.
SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA).

short supply. This opens new opportunities for venture capitalists and corporate investors. Although U.S. companies have been cautious about investing in Eastern Europe, the market is simply too large to leave untapped for long.

The level of skills in Eastern Europe is equivalent to that in Western Europe and the United States. There is a large pool of researchers and labor that can provide a relatively inexpensive and highly skilled work force. Some pharmaceutical production in Eastern Europe is already up to U.S. standards, or can easily be brought up to U.S. standards. Analysts believed that if the United States adopts a medium- to long-term perspective on investments, the Eastern European countries hold out the promise of enormous opportunities.

Outlook for 1991

Industry shipments are expected to increase 4.1 percent, in constant dollars, while product shipments will increase 4.7 percent. Productivity is expected to rise 4.6 percent. Employment will reach approximately 180,600, of whom 83,700 will be in production. Exports are expected to rise to $6.3 billion, and imports are projected to increase to $5.1 billion.

Long-Term Prospects

The volume of shipments will grow 4.2 percent for the next five years. Productivity should remain at a moderately high level. To maintain profit margins, drug companies will be under pressure to develop new products. Barring any antitrust problems, some companies will join forces in cooperative ventures to maximize R&D and cut costs.

MEDICINALS AND BOTANICALS

Industry shipments in current dollars are expected to have reached $4.9 billion in 1990, an 8 percent increase over 1989. Product shipments are estimated at $5.9 billion, 8.5 percent above 1989. In constant dollars, these increases equate to 7.1 and 7.2 percent, respectively. Exports rose to $3.5 billion in 1990, 20 percent above 1989. Imports increased to $2.8 billion, 20 percent above 1989.

Productivity rose 3.9 percent in 1990. Employment increased to 11,600, of whom 6,400 were in production. The hourly wage for production workers increased an estimated 2.7 percent to $16.82.

Outlook for 1991

Medicinals and botanicals industry shipments are forecast to increase 7.1 percent in real terms. Product shipments are expected to increase by 7 percent. Total employment will increase slightly to 11,800, of whom 6,300 will be in production, a slight decrease from 1990. Productivity is expected to increase about 9 percent. The value of exports will increase to about $4.2 billion, while imports will increase to $3.4 billion.

Long-Term Prospects

The industry is expected to grow 4 to 5 percent for the next five years, more than previously predicted. Part of the reason for the higher-than-expected growth rate is that domestic production is supplementing some imports. In addition, more original patent holders are believed to be offering medicinal chemicals, formerly under patent, to generic companies.

PHARMACEUTICAL PREPARATIONS

Industry shipments increased to $45.5 billion in 1990, an increase of 12.1 percent over 1989, and 3.5 percent in constant dollars. Product shipments were valued at $37.9 billion, 12.6 percent over 1989, or 4 percent in real dollars. The value of exports reached $1 billion, 20 percent above 1989, while imports were also valued at $1 billion, 19.8 percent above the previous year.

Employment totaled 138,000, including 62,700 production workers, whose wages averaged $13.58 per hour. Productivity increased 3.2 percent in 1990.

Shipments of prescription drug products are expected to reach almost $27 billion in 1990, 12.5 percent above 1989. In order for prescription drugs to reach their sales peak as soon as possible once they have won Food and Drug Administration (FDA) approval, innovators are resorting to direct-to-consumer advertising. Although physicians and other medical practitioners were initially critical, more are becoming attuned to having patients request specific new drugs that they hear advertised. Direct advertising could affect long-term sales of these prescription drugs, even after their patents have expired. Ordinarily, innovators can expect to retain 50 percent of the market for two years after the patent expires. Some physicians may make prescribing decisions based on advertising alone, but the majority prefer to be briefed by detailers, as drug company sales persons are known. Although long an integral part of the industry, detailing has become very expensive, costing in excess of $90 per visit to a physician's office, by some estimates.

Third-party prescriptions, which are paid for by Medicaid or an insurer rather than by the patient, account for about 40 percent of the prescription market. By 1995, this share of the market is expected to grow to 60 percent. Medicaid alone accounts for about 20 percent of the prescription market.

According to a recent market survey, mail-order pharmacies, which offer convenience and lower prices, dispense an estimated 5 percent of all outpatient prescriptions written in the United States. By 1995, this is expected to increase to

A 3.3 percent increase in productivity contributed to an after-tax profit of about 15 percent for the drug industry.

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8.5 percent. Company medical plans, unions, and trade associations, among others, are encouraging employees to order prescription drugs by mail to help keep costs down.

According to one market research study, generic prescription drugs make up about 30 percent of the total prescription market. Another study found that sales of non-branded generic drugs rose from $3.4 billion in 1988 to $4 billion in 1989, and sales are expected to reach $13.2 billion by 1995. This would give the so-called generic companies a greater share of the total generic market.

Another market survey indicates that the recent generic drug scandals will not have a lasting effect on sales. Although FDA approvals of generic drugs have slowed to half the rate of three years ago, even the companies directly affected by the scandals are expected to return to their previous sales volumes. Many will be acquired by other companies.

Hospitals, which account for 20 percent of prescription drug purchases, emphasize the use of generic drugs. So do health maintenance organizations (HMOs), which account for more than 15 percent of prescriptions. A recent poll revealed that 74 percent of all Americans are reasonably confident that generics are as effective as the branded originals, and about 60 percent recently switched to a generic.

Use of generics is on the increase in Western Europe as well, with the United Kingdom and West Germany leading the way. Generics are taking longer to catch on in France and Italy. Generic drug shipments in Europe were estimated to be more than $2 billion in 1990.

Not surprisingly, the lion's share of research is being devoted to cancer and cardiovascular disease, the two leading causes of death among people over 65. Currently, 183 drugs for these two diseases are under development. Another 76 drugs are being developed for the treatment of chronic geriatric disabilities such as arthritis and Alzheimer's disease. Indeed, one-half of the industry's research is devoted to discovering treatments for diseases of the elderly.

Shipments of nonprescription drugs reached an estimated $10.4 billion in 1990. Three out of four Americans use nonprescription drugs regularly. The U. S. middle-aged population (35 to 59) makes up the largest buying group for these products. Women use nonprescription drugs more frequently than men.

Self-medication with nonprescription drugs plays an important role in the U.S. health care system. According to a major market survey, 87% of consumers consider it important to have a wide choice of nonprescription drugs to treat minor medical problems. Six out of every 10 medicines purchased today are nonprescription. Yet total spending for such drugs amounts to less than 2 cents of every dollar spent on health care in the United States. More direct consumer access to a greater number of nonprescription drugs could reduce health expenditures by more than $35 billion by the end of this decade. Every $1 spent on nonprescription drugs saves an estimated $2 in health care costs.

More than 200 nonprescription products available today incorporate active medicinal ingredients that were not available over the counter just 12 years ago. The industry expects to petition the FDA for permission to switch 57 more prescription drugs to nonprescription status within the next 3 to 5 years. Some 33 drugs that have yet to be approved for over-the-counter sale in the United States are available without prescription in other industrialized nations. Among these are treatments for gastric ulcers, antihistamines, parasiticides, analgesics, antipruitics, and bronchodilators. The FDA is expected to grant some of these drugs nonprescription status in 1991.

Outlook for 1991

Industry shipments (in constant dollars) are expected to increase 3.5 percent, while product shipments will go up 4 percent. Productivity will increase between 3 and 4 percent.

Long-Term Prospects

The long-term outlook is for product shipments to grow at a rate of 3 to 4 percent a year through 1995.

DIAGNOSTICS

Diagnostics industry shipments in 1990 are estimated to increase by 8.4 percent to $2.5 billion. In constant dollars the increase is 6.6 percent. Diagnostics product shipments are estimated at $3.4 billion, an 8.8 percent increase over 1989, or 6.8 percent in constant dollars. Exports rose to $772 million, 15 percent over 1989, while imports were $130 million, 10.2 percent above the previous year.

Total employment in the diagnostics industry is estimated at 15,000, of whom 8,000 were in a production capacity. Earnings averaged $11.70 per hour. Productivity increased about 8 percent in 1990.

Sales of home diagnostic kits are growing as consumers become more sophisticated in their use and the kits become more reliable. For example, pregnancy test kits are now up to 98 percent reliable. As people become ever more health conscious, the tendency to self-monitoring will grow. Besides pregnancy test kits, the most commonly used chemical-type kits are for testing or detecting fertility, blood glucose, and gastrointestinal bleeding.

Outlook for 1991

Diagnostic industry shipments are expected to increase 6.9 percent in constant dollars. Employment will rise to 15,100, including 8,100 production workers. Productivity is expected to increase 5.5 percent. Exports of diagnostics and biologicals combined are expected to reach $890 million, 15 percent above 1990. Imports are expected to be $145 million, 11.5 percent above 1990.

Long-Term Outlook

Long-term, the industry's rate of growth is expected to be slightly more dynamic than previously anticipated, rising to about 6.5 percent a year through 1995. At the same time, however, growth is being held back as fewer new diagnostics win FDA approved, especially home-use kits. This is so because of fear in medical circles that some home test results can be misinterpreted. In addition, some test kits have a short shelf life, which could lead to marketing and consumer problems.

BIOLOGICALS

Biological industry shipments are expected to increase to more than $2 billion in 1990, a 10.7 percent increase over 1989. In constant dollars this represents a 5.5 percent increase. Shipments of biologicals are estimated at $2.4 billion, or 10.8 percent above 1989. In constant dollars the increase is 5.7 percent.

Employment rose to 13,700, including 6,300 production workers earning an average of $9.25 per hour. Productivity was up 5.8 percent. The drug industry is spending large sums on research to develop a vaccine that will protect against AIDS. Such a vaccine could be available as early as 1993.

Although most vaccines are still used on pre-school children, more and more adults are becoming aware of the benefits of being vaccinated against such diseases as pneumonia and influenza. This adds to the industry's growth potential.

Outlook for 1991

Measured in constant dollars, both industry and product shipments will increase about 6 percent. Productivity is expected to increase 4.3 percent.

Long-Term Prospects

For the long term, shipments of vaccines should increase at an annual rate of 4 percent through 1995, while shipments of biologicals as a whole should be somewhat higher.—*Leo McIntyre, Office of Chemicals and Allied Products,(202) 377-0128, August 1990.*

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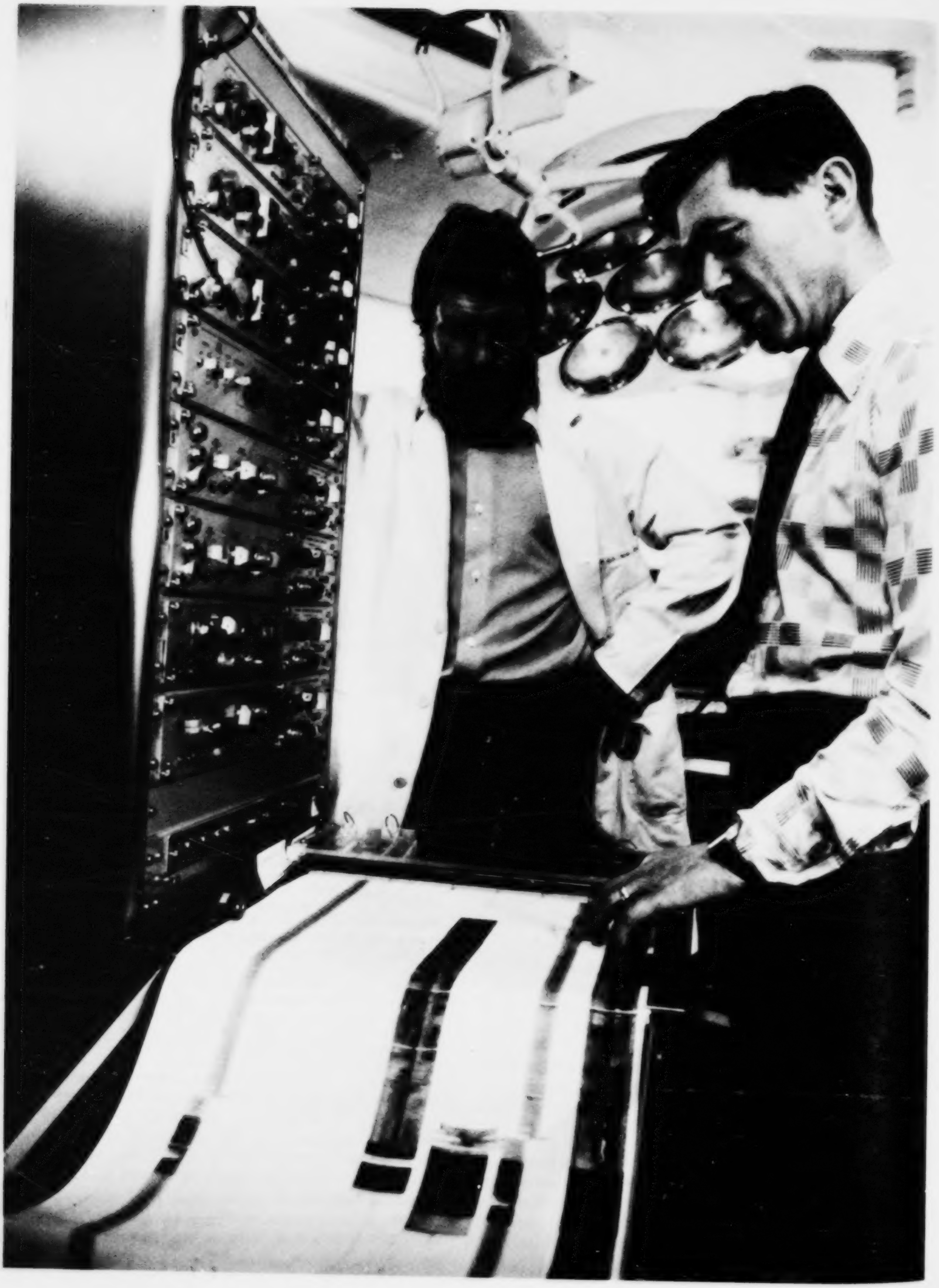

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Medical and Dental Instruments and Supplies

Manufacturers of medical and dental instruments and supplies are forecast to increase their shipments by 7.3 percent in 1991 (in terms of 1987 dollars), compared with 9.1 percent in 1990. This total includes a gain of 8.6 percent for surgical and medical instruments (SIC 3841), 7.6 percent for surgical appliances and supplies (SIC 3842), 5.9 percent for dental equipment and supplies (SIC 3843), 4.9 percent for x-ray apparatus and tubes (SIC 3844), and 5.5 percent for electromedical equipment (SIC 3845).

The outlook for the medical and dental instruments and supplies industries remains mixed. U.S. health care expenditures, which increased 10.4 percent to a record $540 billion in 1988, have contributed to the strong growth of these industries. However, hospitals, the largest end-users, are facing extreme pressures by the U.S. Government and other third-party payers to curtail these rising health care expenditures. Hospitals account for 52 percent of the $25 billion medical equipment market (Figure 46-1 and Table 1). These cost containment efforts have affected the overall financial status of the hospital industry. Total hospital margins—the difference between total hospital revenues and total hospital costs—have declined from 7.6 percent in 1984, the first year the Government's Prospective Payment System went into effect, to 3.8 percent in 1988.

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Despite this financial hardship, hospitals have been increasing capital expenditures for construction to expand their outpatient facilities to generate new revenues from this strongly growing health care market segment. As these capital expenditures are completed in 1991, hospitals will need to increase their equipment spending to outfit newly expanded facilities.

High-quality medical devices that reduce or eliminate costly surgery and long hospital stays will be used more frequently. According to the Prospective Payment System, hospitals will save almost $100 million in 1990 through using medical non-surgical technologies such as endoscopic lasers, lithotripsy, angioplasty, and valvuoplasty.

Outside the hospitals, the use of cost-reducing medical devices are gaining wider acceptance in patients' homes. These low-cost devices include infusion pumps for medication, portable monitors for high risk pregnancies, and ventilators for infants.

Figure 46-1
U.S. Estimated Medical Products Market, 1989

Location	Medical Product Purchases		Comments
	(millions $)	(% of total)	
Hospitals, includes on-premises outpatient facilities	13,500	52	Surgery-related products account for about 55%
Nursing homes and other long-term-care facilities	1,800	7	Emphasis on incontinence and products for chronic diseases
Solo/group practices and clinics (MD, DO, DD, and other professionals)	5,500	21	Dental products account for 40%, clinical testing products for 14%
Freestanding ambulatory centers (e.g., urgent care, surgery, diagnostic imaging, and reference labs)	550	2	About 3,000 urgent-care/emergency centers account for over half
Home	4,650	18	Medicare and Medicaid account for 55% of all home-care billings
Total 1989	**$26,000**	**100%**	

Source: Biomedical Business International, Santa Ana, CA. *(Used with permission.)*

The aging population in the United States and abroad represents an important market for U.S. suppliers of medical and dental instruments and supplies. The proportion of the population aged 65 and older in the United States is projected to rise from 9.8 percent in 1970 to 13.0 percent by the year 2000. This growing elderly population will expand its demands for diagnostic and therapeutic services.

Demand for medical products is growing because of the continued increase in the incidence of certain diseases such as AIDS. In 1987 AIDS ranked as the 15th leading cause of death in the United States. The increase in infectious

Table 1: U.S. Market for Medical and Dental Equipment and Supplies 1987–91

(in billions of dollars except as noted)

Item	1987	1988	1989	1990	1991	Average Annual Growth 1987-91 (percent)
Shipments[1]	21.5	23.2	25.6	27.8	29.9	8.6
Imports[2 3]	2.6	3.0	3.1	3.3	3.6	8.5
Exports[3]	3.2	4.0	4.9	5.8	6.5	19.4
Consumption	20.9	22.2	23.8	25.3	27.0	6.6
Import share of consumption (percent)	12.4	13.5	13.0	13.0	13.3	1.8

[1] Product shipments measured in current dollars; 1988 data is preliminary; 1989-90 is estimated; 1991 is forecast.

[2] Imports are c.i.f.

[3] 1987-88 data are reconstructed from the Harmonized System (HS) of trade classification implemented in 1989; 1990 data is annualized under the HS system; 1991 data is forecast.

SOURCE: U.S. Department of Commerce: Bureau of the Census and International Trade Administration.

diseases in general has spurred development of a wide range of infection-control products, such as test kits and intravenous equipment and supplies.

Medical Device Legislation

Medical devices remain one of the most regulated manufacturing industries. Regulations covering issues from a more stringent Food and Drug Administration (FDA) review process to the disposal of medical waste are being proposed at the federal and state levels and will affect selected segments of the industry. According to the industry, such regulations could substantially reduce the long-term growth prospects of medical devices.

Among the most important proposals affecting the industry are Congressional efforts to modify the Medical Device Amendments to the Federal Food, Drug, and Cosmetic Act. In 1990, Congressman Henry Waxman, chairman of the Subcommittee on Health and Environment, introduced HR 3095 to add safeguards for using medical devices. Currently, manufacturers of medical equipment are responsible for reporting deaths or serious injuries related to the operation of their devices. Among other things, the bill would require hospitals, clinics, and other end-users also to report these incidents. Some manufacturers and end-users argue that the proposed legislation would create redundant reporting requirements and would add on additional burdens to the already strapped resources of the FDA. Legislators contend that these changes are needed to better regulate the safe use of medical devices.

Technology

Research and develpment (R&D) expenditures have shown an upward trend in recent years, rising from 5.5 percent of net sales in 1986 to 6.2 percent in 1989. This is nearly double the national industrial rate of 3.4 percent. Firms active in medical electronics invest even more in R&D. Despite these investment levels in R&D, U.S. firms are beginning to lose their edge against foreign competitors. While the industry is still ahead of the European Community (EC) and Japan in R&D expenditures, it is expected to lose ground to these foreign competitors in introducing new products into the world marketplace in the coming decade.

INTERNATIONAL COMPETITIVENESS

International trade is playing an increasingly important role in medical equipment sales. Exports now account for 21 percent of product shipments, the highest ratio to date. These exports are primarily geared to developed countries that spend a significant share of their per capita income on health care.

Medical-equipment exports reached approximately $5.8 billion in 1990, representing an increase of 19 percent from 1989. These exports have grown at double-digit rates for five years and are expected to remain high, as U.S. industry seeks to expand into foreign markets.

U.S. imports of medical equipment in 1990 increased 9 percent to $3.3 billion. This is the second consecutive year that imports have grown at a slower rate then exports. The sharp growth in exports contributed to a fourth consecutive annual increase in the U.S. trade surplus. In 1990, the surplus was $2.4 billion, up 37 percent from the 1989 level.

The European Community (EC), comprising the economies of 12 Western European countries, accounts for 40 percent of U.S. exports, and supplies 43 percent of U.S. imports. The EC is developing directives that will determine how medical devices will gain entry into this important market. In 1990, the EC adopted the active implantable medical device directive covering items such as pacemakers. Another directive covering other medical equipment is expected to be adopted in the near future. These directives are based on international standards, an area where the United States historically has not been influential.

As Eastern Europe undertakes steps to restructure and modernize its economy, U.S. medical equipment companies are beginning to pursue emerging trade and investment opportunities there. While U.S. exports to Eastern Europe are less than 1 percent of worldwide exports, this figure is expected to grow significantly in the next 10 years. Substantial decontrol of high technology medical devices, will significantly enhance export prospects to these non-EC market countries.

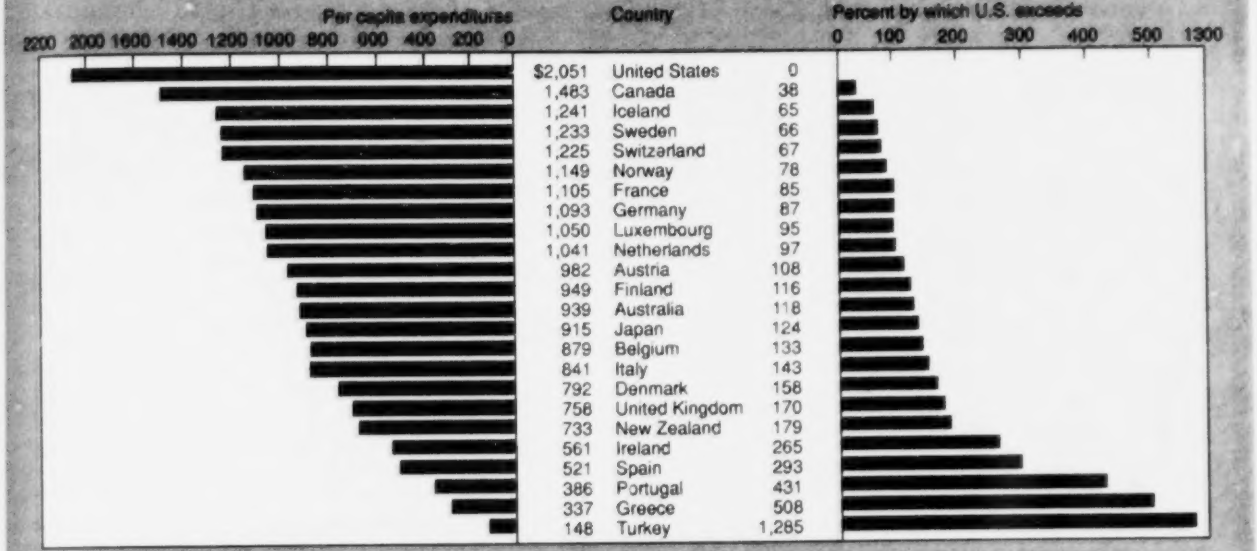
SURGICAL AND MEDICAL INSTRUMENTS

Manufacturers of surgical and medical instruments (SIC 3841) increased shipments to an estimated $9.5 billion in 1990, representing a 10.2 percent increase (in 1987 dollars). Industry shipments of these primarily non-electric diagnostic and therapeutic devices have grown consistently since the sharp increases of the mid-1980s, fueled by health concerns over the spread of AIDS and other infectious diseases.

Total employment stood at 84,950 in 1990, an increase of 3.5 percent over the 1989 level of 82,080. Production workers made up 61 percent of the work force.

Figure 46-2

Per Capita Health Expenditures in the United States and Other Countries, 1987



Source: *Medicare Prospective Payment and the American Health Care System, Report to Congress*, June 1990, Prospective Payment Assessment Commission.

Exports reached almost $1.9 billion in 1990, increasing 23 percent from 1989 owing to strong foreign demand for disposable products. Exports accounted for about 19.6 percent of product shipments. Imports in 1990 are estimated to have increased 12 percent to $756 million, resulting in a trade surplus of $1.1 billion, a 31 percent increase over the previous year (Table 2).

Outlook for 1991

Industry shipments of surgical and medical instruments are projected to increase 8.6 percent in 1991, measured in 1987 dollars. Due to the sharp increases in the number of AIDS cases, manufacturers of disposable devices—ranging from test kits for infectious diseases to disposables used in blood transfusion—should continue to contribute heavily toward industry growth. In particular, products emphasizing safety against infection for those who administer treatment are expected to do well.

Table 2: U.S. Trade in Surgical and Medical Instruments, 1989

(in millions of dollars)

U.S. Exports		U.S. Imports	
Destination	Value	Source	Value
European Community*	657	European Community*	202
Japan	216	Japan	144
Canada	143	Mexico	96
Mexico	90	Dominican Rep.	61
Australia	52	Singapore	59
WORLD	1,518	WORLD	675

SOURCE: U.S. Department of Commerce, Bureau of the Census.

*For a description of the European Community, see the introductory chapter "How to Get the Most Out of This Book."

General Electric Company's Medical Systems Group

During the five-year period ending in 1995, industry shipments of medical and surgical instruments should increase about 5 percent in 1987 dollars.

Pressures to hold down costs are making hospitals look more readily to prime vendors for procuring many types of medical instruments and supplies. Hospitals can reduce their supply costs by limiting the number of manufacturers and distributors they deal with. Even the largest manufacturers have been providing an ever-growing share of their products through distributors. This trend is expected to continue in 1991.

Non-hospital surgery centers and individual physicians, accounting for 23 percent of outpatient surgeries, are expected to demand more surgical instruments. Physician office surgery alone increased 20 percent in 1990 to about 1.25 million procedures and is expected to remain high in 1991.

Exports should level out in 1991 to about 15 percent growth over 1990 results. As in the past, currency fluctuations will affect export growth, as well as the success of the large manufacturers, who as a group derive significant revenue from exports.

Long-Term Prospects

During the 5-year period ending 1995, industry shipments of medical and surgical instruments are forecast to increase about 5 percent (in 1987 dollars).

Domestically, medical devices used in infection control of contagious diseases are expected to plateau after the sharp growth in the late 1980s. The market may be rekindled if Congress approves a bill providing $4 billion to health care institutions for treating AIDS patients. The bill must gain approval from President Bush, who opposes specific funding for AIDS. As a result, some of the prominent U.S. multinational manufacturers of AIDS test kits and other related supplies are expected to make strong bids to expand the distribution of these products in foreign markets.

Disposal of medical waste will remain a primary concern of the medical instruments and supplies companies. While the industry prefers to resolve the problem of solid waste disposal by an integrated and comprehensive system for waste processing and disposal, states are focusing on legislation requiring manufacturers to use biodegradeable plastics to reduce the large and growing volume of solid waste.

SURGICAL APPLIANCES AND SUPPLIES

The surgical appliances and supplies industry (SIC 3842) is the largest in the medical and dental group, accounting for about 37 percent of the group's shipments. Industry shipments increased 8.8 percent to an estimated $10.7 billion. The industry has registered consecutive increases measured in constant dollars since 1977.

This industry manufactures a wide range of products including walkers, wheelchairs, orthopedic supplies, bandages, hearing aids, and protective clothing. Product areas showing strong growth in 1989 were orthopedic implants and hospital respiratory care equipment.

The industry employed an estimated 87,230 people in 1990, up 2.7 percent from 1989. Production workers numbered about 54,420, or 62.4 percent of the total work force.

INTERNATIONAL COMPETITIVENESS

While international trade historically has been limited for this industry, exports are beginning to play an important role. Exports accounted for 6.2 percent of product shipments in 1980. Ten years later this rate had increased to 12.0 percent. U.S. exports of surgical appliances and supplies rose 26 percent in 1990 to $1.2 billion, the third consecutive year of double digit growth. Principal export items remain internal fixation devices and orthopedic equipment and supplies.

Similarly, total U.S. imports of surgical appliances and supplies accounted for only 5.6 percent of domestic consumption in 1990, the lowest in the medical products group. The value of these imports was about $530 million in 1990, an increase of 27 percent over 1989. Principal imports were mechano-therapy and oxygen therapy apparatus, and hearing aids.

The EC purchased 38 percent of U.S. exports of these products and supplied 35 percent of U.S. imports in 1989. Exports of these items increased sharply to Canada, France and Japan in 1990. This trend reflects aging of populations and the growth of public expenditures on health care in these countries (Table 3).

Outlook for 1991

The value of U.S. shipments of surgical appliances and supplies is expected to increase about 7.6 percent in 1991,

Trends and Forecasts: Surgical and Medical Instruments (SIC 3841)

(in millions of dollars except as noted)

Item	1987	1988[1]	1989[2]	1990[2]	1991[3]	Percent Change 1987–88	1988–89	1989–90	1990–91
Industry Data									
Value of shipments[4]	7,780	8,250	8,993	9,847	10,635	6.0	9.0	9.5	8.0
Value of shipments (1987$)	7,780	8,094	8,622	9,505	10,325	4.0	6.5	10.2	8.6
Total employment (000)	73.1	76.0	82.1	84.9	—	4.0	8.0	3.4	—
Production workers (000)	45.4	46.9	50.6	51.8	—	3.3	7.9	2.4	—
Average hourly earnings ($)	8.91	9.54	—	—	—	7.1	—	—	—
Capital expenditures	355	385	—	—	—	8.5	—	—	—
Product Data									
Value of shipments[5]	7,232	7,984	8,703	9,529	10,292	10.4	9.0	9.5	8.0
Value of shipments (1987$)	7,232	7,833	8,344	9,198	9,719	8.3	6.5	10.2	5.7

[1] Advance data from the 1988 Annual Survey of Manufactures.

[2] Estimate.

[3] Forecast.

[4] Value of all products and services sold by establishments in the surgical and medical instruments industry.

[5] Value of products classified in the surgical and medical instruments industry produced by all industries.

SOURCE: U.S. Department of Commerce, Bureau of the Census, International Trade Administration (ITA). Estimates and forecasts by ITA.

Trends and Forecasts: Surgical Appliances and Supplies (SIC 3842)

(in millions of dollars except as noted)

Item	1987	1988[1]	1989[2]	1990[2]	1991[3]	Percent Change 1987-88	1988-89	1989-90	1990-91
Industry Data									
Value of shipments[4]	8,533	9,350	10,192	11,078	11,876	9.6	9.0	8.7	7.2
Value of shipments (1987$)	8,533	9,105	9,791	10,652	11,463	6.7	7.5	8.8	7.6
Total employment (000)	78.5	81.2	84.9	87.2	—	3.4	4.6	2.7	—
Production workers (000)	51.1	52.1	53.2	54.4	—	2.0	2.1	2.3	—
Average hourly earnings ($)	8.78	8.84	—	—	—	0.7	—	—	—
Capital expenditures	215	215	—	—	—	0.0	—	—	—
Product Data									
Value of shipments[5]	7,980	8,518	9,285	10,092	10,819	6.7	9.0	8.7	7.2
Value of shipments (1987$)	7,980	8,334	8,919	9,704	10,216	4.4	7.0	8.8	5.3

[1] Advance data from the 1988 Annual Survey of Manufactures.

[2] Estimate.

[3] Forecast.

[4] Value of all products and services sold by establishments in the surgical appliances and supplies industry.

[5] Value of products classified in the surgical appliances and supplies industry produced by all industries.

SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA). Estimates and forecasts by ITA.

Table 3: U.S. Trade in Surgical Appliances and Supplies, 1989

(in millions of U.S. dollars)

U.S. Exports		U.S. Imports	
Destination	Value	Source	Value
European Community*	364	European Community*	146
Canada	143	Mexico	64
Japan	116	Canada	41
Mexico	151	Japan	39
Australia	46	China	23
WORLD	965	WORLD	419

SOURCE: U.S. Department of Commerce, Bureau of the Census.

*For a description of the European Community, see the introductory chapter "How to Get the Most Out of This Book."

measured in constant dollars. Demographic trends and anticipated moderate growth in health expenditures worldwide will continue to support sales. However, public and private sector cost containment efforts are expected to lead to further industry consolidation.

California manufacturers of certain medical supplies may be adversely affected by recently enacted state legislation requiring ethylene oxide emissions to be sharply curtailed. Most medical plastics products need to be sterilized before delivery to end-users. The regulations could cost manufacturers $60 million initially and $15 million per year thereafter.

If past trends hold true, exports will surpass $1.3 billion in 1991, an increase of 15 percent. Export items expected to grow in importance include basic patient-care products such as gauze, adhesives, and respiratory apparatus. Imports should rise only about 2 percent to $541 million, increasing the trade surplus by 20 percent.

Long-Term Prospects

Industry shipments of surgical appliances and supplies are projected to rise at an annual constant-dollar rate of 8 to 10 percent from 1990 to 1995. As the domestic market for orthopedic products grows incrementally due to market saturation, the international market will become even more important for this industry. Europe traditionally has had a lower orthopedic implant rate than the United States. As a result, U.S. suppliers may find new market opportunities there. In addition, U.S. manufacturers will begin to compete for market share in Eastern Europe and the Soviet Union, where international sales should be stimulated by the aging of their populations.

DENTAL EQUIPMENT AND SUPPLIES

The 6.9 percent growth in shipments by the dental equipment and supplies industry (SIC 3843) measured in current dollars was countered by the nearly 4.4 percent price increase at the manufacturers level, leading to a net increase of 2.0 percent in real terms in 1990. The industry is the smallest in the medical group with about 5.3 percent of total shipments.

The dental industry employed approximately 15,320 people in 1990, a 0.7 percent increase over 1989, compared to the 1.4 percent gain the previous year. Production workers still account for about 60 percent of all employees in this industry.

INTERNATIONAL COMPETITIVENESS

U.S. exports of dental equipment and supplies increased 26 percent in 1990 to $334 million, as overseas growth rates exceeded those in the United States. This represented the strongest growth rate of the medical group. Leading destination countries were the European Community, Canada, and Japan. Exports accounted for 25 percent of product shipments, up from 21 percent in 1989.

U.S. imports of dental equipment and supplies reached $162 million in 1990, up 15 percent from 1989 (Table 4). Imports accounted for 14 percent of consumption. This foreign share of the domestic market has been increasing steadily since 1980. Leading imports consisted of dental instruments and dental cements and fillings, predominantly from the European Community and Japan.

Table 4: U.S. Trade in Dental Equipment and Supplies, 1989

(in millions of U.S. dollars)

U.S. Exports		U.S. Imports	
Destination	Value	Source	Value
European Community*	100	European Community*	53
Canada	35	Japan	35
Japan	27	Switzerland	12
Mexico	19	Canada	11
Switzerland	15	Sweden	8
WORLD	265	WORLD	141

SOURCE: U.S. Department of Commerce, Bureau of the Census.

*For a description of the European Community, see the introductory chapter "How to Get the Most Out of This Book."

Trends and Forecasts: Dental Equipment and Supplies (SIC 3843)

(in millions of dollars except as noted)

Item	1987	1988[1]	1989[2]	1990[2]	1991[3]	Percent Change 1987-88	1988-89	1989-90	1990-91
Industry Data									
Value of shipments[4]	1,396	1,473	1,518	1,617	1,689	5.5	3.1	6.5	4.5
Value of shipments (1987$)	1,396	1,437	1,497	1,527	1,617	2.9	4.2	2.0	5.9
Total employment (000)	14.3	15.0	15.2	15.3	—	4.9	1.3	0.7	—
Production workers (000)	8.7	8.9	8.9	9.2	—	2.3	0.0	3.4	—
Average hourly earnings ($)	9.33	8.94	—	—	—	−4.2	—	—	—
Capital expenditures	31.2	30.0	—	—	—	−3.8	—	—	—
Product Data									
Value of shipments[5]	1,216	1,224	1,261	1,343	1,404	0.7	3.0	6.5	4.5
Value of shipments (1987$)	1,216	1,196	1,244	1,268	1,326	−1.6	4.0	1.9	4.6

[1] Advance data from the 1988 Annual Survey of Manufactures.

[2] Estimate.

[3] Forecast.

[4] Value of all products and services sold by establishments in the dental equipment and supplies industry.

[5] Value of products classified in the dental equipment and supplies industry produced by all industries.

SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA). Estimates and forecasts by ITA.

Outlook for 1991

The value of shipments is expected to increase almost 6 percent in 1991, measured in 1987 dollars. Slow growth is expected for traditional dental instruments, as this market segment is affected by stagnant patient demand and low cost imports. Growth will be concentrated on items for preventative care, such as infection control products and dental cements and other non-metallic filling materials.

Certain manufacturers are opposed to increased FDA regulation. The industry seeks to have certain dental implants placed in a lower risk category that does not require pre-market approval applications. The industry cites that adherence to FDA good manufacturing practices and medical device reporting rules provide sufficient safeguards for these products.

Long-Term Prospects

During the 5-year period ending in 1995, dental equipment and supply shipments are forecast to increase at an average annual rate of 4 percent (1987 dollars).

The changing dental needs of the U.S. population should foster moderate growth in the dental industry over the next few years. A sharp decline in the incidence of tooth decay will continue to shift demand toward preventative care. Cosmetic dentistry also is growing in popularity, and demographics indicate an expanding need for restorative procedures for the elderly. Mergers among manufacturers of dental materials and device manufacturers should provide some protection against low-cost imports and the loss of foreign markets to competitor nations.

While the EC is expected to remain the largest market for U.S. dental instruments and supplies, Eastern Europe, in particular the Soviet Union, is actively seeking joint ventures with U.S. firms in the field of dental instruments. Other countries active in promoting dental equipment are Japan and Saudi Arabia.

X-RAY APPARATUS AND TUBES

The value of shipments by the x-ray apparatus and tubes industry, which manufactures radiographic, fluoroscopic, and therapeutic x-ray devices for medical, research, and industrial applications (SIC 3844) increased at a constant-dollar rate of 11.8 percent in 1990 (reaching $2.2 billion). Part of this growth is reflected in increased hospital expenditures on capital items during the 1988–90 period, including those for x-ray based radiology products.

Recent growth has been focused on gamma cameras and other nuclear medicine equipment, digital cardiology units, as well as accessories for x-ray equipment. Despite these gains in growth, the industry has been facing increased foreign competition. Manufacturer prices remain unchanged from the previous year. For some products, prices have even declined. The x-ray apparatus and tubes industry employed about 12,000 people during 1990, an increase of 7 percent over the previous year. The number of production workers increased 5 percent and accounted for nearly 54 percent of total employees.

American Dental Trade Association

U.S. exports of dental equipment and supplies increased 26 percent in 1990 to $334 million. Overseas growth rates for the next few years continue to look promising.

Trends and Forecasts: X-ray Apparatus and Tubes (SIC 3844)

(in millions of dollars except as noted)

Item	1987	1988[1]	1989[2]	1990[2]	1991[3]	Percent Change 1987-88	1988-89	1989-90	1990-91
Industry Data									
Value of shipments[4]	1,554	1,833	2,058	2,243	2,400	18.0	12.3	9.0	7.0
Value of shipments (1987$)	1,554	1,798	2,006	2,243	2,353	15.7	11.6	11.8	4.9
Total employment (000)	8.7	10.2	11.2	12.0	—	17.2	9.8	7.1	—
Production workers (000)	5.5	5.7	6.2	6.5	—	3.6	8.8	4.8	—
Average hourly earnings ($)	12.21	12.49	—	—	—	2.3	—	—	—
Capital expenditures	32.0	47.5	—	—	—	48.4	—	—	—
Product Data									
Value of shipments[5]	1,557	1,522	1,709	1,863	1,993	−2.2	12.3	9.0	7.0
Value of shipments (1987$)	1,557	1,493	1,666	1,945	1,882	−4.1	11.6	16.7	−3.2

[1] Advance data from the 1988 Annual Survey of Manufactures.

[2] Estimate.

[3] Forecast.

[4] Value of all products and services sold by establishments in the x-ray apparatus and tubes industry.

[5] Value of products classified in the x-ray apparatus and tubes industry produced by all industries.

SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA). Estimates and forecasts by ITA.

INTERNATIONAL COMPETITIVENESS

Exports of x-ray apparatus and tubes rose 9.1 percent in 1990 to $575 million. Imports rose 2.8 percent to $890 million. These developments pushed the trade deficit down to $315 million in 1990, compared to $339 million in 1989 (Table 5). Imports accounted for over 40 percent of domestic consumption, the highest in the medical group.

Outlook for 1991

Industry shipments of x-ray apparatus and tubes are forecast to increase 4.9 percent (1987 dollars) in 1991. Certain segments of the radiology market, such as digital cardiology units and special x-ray procedure units, should enjoy renewed growth after a stagnant period in the mid-1980's. Many of these items should be due for replacement during 1991. The industry is concerned about Federal Government efforts to reduce Medicare reimbursement. If successful, this reduction could limit future purchases of radiology equipment.

Internationally, U.S. exports are expected to increase 9 percent as manufacturers seek to broaden their sales bases. Potential exports of select x-ray devices may benefit from the relaxation of U.S. export controls. Demand from the Soviet Union and Eastern Europe is expected to grow as these markets begin to restructure. U.S. imports are forecast to grow at about 6 percent, as foreign suppliers attempt to increase their activity in the U.S. market.

Long-Term Propects

During the 5-year period ending in 1995, industry shipments of x-ray apparatus and tubes are projected to grow at a compound annual rate of 3.5 percent. Hospital demand for x-ray and related products runs in a cyclical pattern, as older products become obsolete or are substantially upgraded. Development of imaging contrast agents for x-ray and computer tomographs, which provide better resolution and less discomfort, may rekindle demand for these products. Sales of traditional cancer therapy products, including those for chemotherapy and radiation therapy, may decline as less costly products and drugs with less severe side effects are developed.

Table 5: U.S. Trade in X-Ray Apparatus and Tubes, 1989

(in millions of U.S. dollars)

U.S. Exports		U.S. Imports	
Destination	Value	Source	Value
European Community*	182	European Community*	590
Japan	98	Japan	189
Canada	52	Sweden	30
Brazil	23	Canada	17
Mexico	19	Finland	14
WORLD	527	WORLD	866

SOURCE: U.S. Department of Commerce, Bureau of the Census.

*For a description of the European Community, see the introductory chapter "How to Get the Most Out of This Book."

While imports should remain low, they will nonetheless account for a significant portion of the x-ray apparatus and tubes market.

ELECTROMEDICAL EQUIPMENT

The value of shipments by the electromedical equipment industry (SIC 3845), which manufactures a wide range of powered medical devices (excluding irradiation equipment), grew at a constant-dollar rate of 8.5 percent in 1990 following an increase of 16.6 percent in the previous year. This industry has shown gains in the last 4 years, after declining in 1985 and 1986, reflecting the industry's cyclical nature.

Industry employment rose 3.2 percent to about 31,580 during 1990. Production worker employment increased 0.2 percent, but still accounted for slightly less than 50 percent of total employees.

Price increases at the manufacturer level have averaged only about 0.5 percent since 1985, as firms have sought to provide lower cost electromedical equipment to health care end-users. Hospital expenditures for capital equipment has also benefitted certain portions of the electromedical equipment industry. Purchases of magnetic resonance imaging (MRI) devices and ultrasound devices have remained high as more end-users have become aware of the capabilities of these medical devices.

INTERNATIONAL COMPETITIVENESS

Exports of electromedical equipment increased 13.2 percent in 1990 to $1.8 billion after declining 5.5 percent in 1989 (Table 6). Imports increased 4.4 percent. The resulting 1990 trade surplus rose sharply to $792 million after two consecutive years of declines.

Trends and Forecasts: Electromedical Equipment (SIC 3845)

(in millions of dollars except as noted)

Item	1987	1988[1]	1989[2]	1990[2]	1991[3]	Percent Change 1987-88	1988-89	1989-90	1990-91
Industry Data									
Value of shipments[4]	3,577	4,118	4,731	5,109	5,569	15.1	14.9	8.0	9.0
Value of shipments (1987$)	3,577	4,029	4,698	5,099	5,381	12.6	16.6	8.5	5.5
Total employment (000)	29.2	31.3	31.5	31.6	—	7.2	0.6	0.3	—
Production workers (000)	13.2	14.1	14.2	14.2	—	6.8	0.7	0.0	—
Average hourly earnings ($)	10.21	10.81	—	—	—	5.9	—	—	—
Capital expenditures	115	122	—	—	—	6.1	—	—	—
Product Data									
Value of shipments[5]	3,513	3,999	4,594	4,962	5,408	13.8	14.9	8.0	9.0
Value of shipments (1987$)	3,513	3,913	4,562	4,952	5,107	11.4	16.6	8.5	3.1

[1] Advance data from the 1988 Annual Survey of Manufactures.

[2] Estimate.

[3] Forecast.

[4] Value of all products and services sold by establishments in the electromedical equipment industry.

[5] Value of products classified in the electromedical equipment industry produced by all industries.

SOURCE: U.S. Department of Commerce: Bureau of the Census; International Trade Administration (ITA). Estimates and forecasts by ITA.

Exports accounted for 36.2 percent of U.S. shipments of electromedical equipment. This is the highest ratio of the five industries in the medical equipment group. As the most export-dependent in the medical group, the industry is especially sensitive to foreign exchange rate fluctuations and other external factors influencing trade.

Outlook for 1991

Industry shipments of electromedical equipment are forecast to increase 5.5 percent (1987 dollars) in 1991. Hospital spending for high-tech electromedical equipment is expected to remain strong as software upgrades and new technological developments fuel the growth of non-x-ray-based imaging devices. Many of these new developments will help hospitals reduce costs and improve efficiency. For example, echocardiography has gained acceptance as a safer and more economic method for imaging a patient's cardiovascular system, compared to other imaging modalities.

U.S. exports are expected to increase 8.5 percent and imports about 12 percent as the electromedical equipment industry becomes more global. Meanwhile, U.S. firms will gain a better understanding of the requirements to market in the European Community, as member countries begin to adopt the first medical equipment directive covering active implantable devices such as pacemakers. U.S. firms will also seek to expand in Eastern Europe, where little activity has taken place in this product sector.

Table 6: U.S. Trade in Electromedical Equipment, 1989

(in millions of U.S. dollars)

U.S. Exports		U.S. Imports	
Destination	Value	Source	Value
European Community*	676	European Community*	414
Japan	271	Japan	337
Canada	148	Mexico	60
Australia	55	Israel	30
Sweden	55	Sweden	22
WORLD	1,589	WORLD	964

SOURCE: U.S. Department of Commerce, Bureau of the Census.

*For a description of the European Community, see the introductory chapter "How to Get the Most Out of This Book."

Long-Term Prospects

During the 5-year period ending in 1995, industry shipments of electromedical equipment are projected to grow at a compound annual rate of 6 percent. Domestically, demographics will drive the electromedical industry, as the aging population utilizes a large share of electro-diagnostic and therapeutic devices. In addition, demand for these products by outpatient facilities will remain strong.

Internationally, competition will remain fierce in the electromedical equipment industry. Although U.S. firms have invested heavily in research and development, they must follow up by successfully commercializing their technology. European and Japanese competitors are becoming increasingly adept at introducing new high-tech medical products resulting from their R&D efforts.—*Michael Fuchs, Office of Microelectronics and Instrumentation, (202) 377-0550, August 1990.*

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Commercial Banking

Competition will be the key word for the 1990s as financial institutions vie for superiority in the highly contested arena of commercial banking, investment banking, insurance, and real estate. This rivalry among competing industries will lead to improved and less expensive services for consumers, possibly including the much-heralded one-stop financial center.

Continued economic expansion, relatively stable interest rates, and low inflation contributed to the fundamental soundness of the U.S. banking system in 1990. However, as a result of the late stage of the business cycle, the soft real estate market, and the continuing international debt problems, commercial bank loans were expected to grow at a slower rate in 1990 than in 1989, from $2,197 billion to $2,329 billion, a 6 percent increase. Bank investments, which usually change in inverse proportion to the rate of loan growth, are expected to grow faster than in 1989, from $550 billion to $605 billion, an increase of 10 percent.

Profitability of Banks

The profitability of insured commercial banks declined in 1989 after having rebounded in 1988. Higher loan loss provisions by large banks with substantial loans to developing countries helped drive down the average return on assets, measured by net income as a percentage of average fully consolidated assets, to 0.51 percent in 1989. This compares with 0.84 percent in 1988. By contrast, banks with less than $300 million in assets increased their return on assets from 0.74 percent in 1988 to 0.88 percent in 1989.

The average return on equity, measured by net income as a percentage of average equity capital, also decreased for the industry as a whole, falling from 13.52 percent in 1988 to 7.94 percent in 1989. As with return on assets, banks with less than $300 million in assets experienced a different trend. Their return on equity increased from 8.89 percent in 1988 to 10.32 in 1989.

During the first half of 1990, profits of large banks continued to suffer as a depressed real estate market forced them to make additional loss provisions. Surveys by Federal Reserve Banks revealed that credit for real estate—and especially for commercial real estate—has been tightened. Credit also has been tightened for commercial and industrial loans to small- and medium-sized businesses.

Table 1: Profit Rates of Insured Commercial Banks, 1985–89

(percent)

Item	1985	1986	1987	1988	1989
Return on assets[1]	0.70	0.62	0.11	0.84	0.51
Return on equity[2]	11.18	9.97	1.80	13.52	7.94

[1] Net income as a percentage of average fully consolidated assets net of loss reserves.

[2] Net income as a percentage of average equity capital.

SOURCE: Board of Governors of the Federal Reserve System.

Failures and Problem Banks

As a result of the poor quality of many loan portfolios, a record 206 banks failed in 1989. This drained the assets of the Bank Insurance Fund by $851 million, leaving it with $13.2 billion to back up nearly $1.9 trillion of insured deposits. As a result, the fund's reserves were equal to only 0.7 percent of insured deposits at the end of 1989, down from 0.8 percent a year earlier. In 1990 the fund was expected to have lost as much as $2 billion, which would lower its reserves to an estimated 0.55 percent of insured deposits. To make up for the losses, the Federal Deposit Insurance Corporation (FDIC) raised its premiums from 12 cents for every $100 of insured deposits in 1990 to 19.5 cents in 1991.

The number of bank failures, which has risen every year since 1984, was expected to be lower in 1990 than in the previous year.

The length of the FDIC's list of problem banks reflects the poor quality of many bank loans. However, the decline in problem banks that began a few years ago continued into 1989, when 1,110 banks made the list. This compares with 1,415 in 1988, 1,443 in 1987, and 1,484 in 1986.

Trends and Forecasts: Commercial Banking (SIC 602)

(in billions of dollars, except as noted)

Item	1987	1988	1989	1990[1]	1991[2]	Percent Change 1987–88	1988–89	1989–90	1990–91
Assets	2,847	3,036	3,229	3,340	3,588	6.6	6.4	3.4	7.4
Loans	1,899	2,040	2,197	2,329	2,480	7.4	7.7	6.0	6.5
Investments	514	533	550	605	657	3.7	3.2	10.0	8.6
Deposits	2,009	2,143	2,265	2,378	2,509	6.7	5.7	5.0	5.5
Employment	1,562	1,557	1,573	1,585	1,593	–.3	1.0	0.8	0.5

[1] Estimate.

[2] Forecast.

SOURCE: Board of Governors of the Federal Reserve System and Department of Labor, Bureau of Labor Statistics. Estimates and forecasts by U.S. Department of Commerce, International Trade Administration.

The number of foreign bank offices in the United States grew steadily throughout the 1970s and 1980s, reaching 716 at the beginning of 1990 (Table 2). These offices include branches, agencies, subsidiaries, Edge Act and Agreement corporations, and New York State investment companies. Of the total, 361 are branches, 218 are agencies, 101 are subsidiaries more than 25 percent owned by foreign banks, 26 are Edge Act corporations, and 10 are investment companies. Nearly one-half of the offices are in New York, with most of the rest in California, Illinois, and Florida. Japan, Canada, the United Kingdom, and France have the largest number of bank offices in the United States. Assets of foreign bank offices in the United States have increased significantly in recent years, rising from $198 billion in 1980 to $738 billion in 1989.

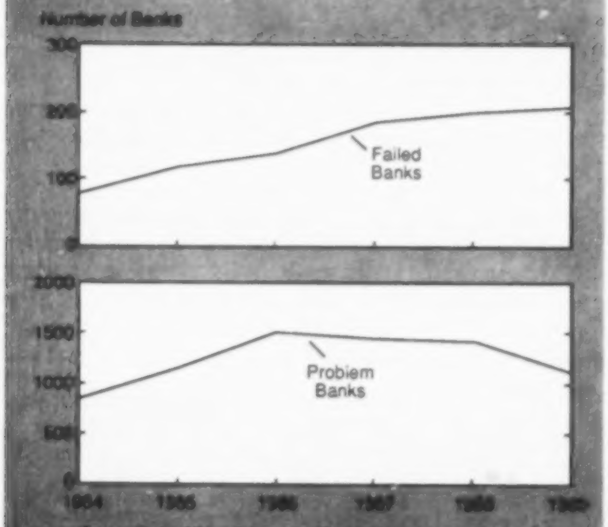
Branches of foreign banks are full-service banking offices that compete directly with local banks and are subject to all local banking laws and regulations.

Agencies can make commercial and industrial loans and finance international transactions. But they cannot accept deposits or perform trust functions, and hence they are not subject to reserve requirements or loan limits.

A commercial bank subsidiary is any bank that is majority-owned or effectively controlled by a foreign bank. Unlike branches which are administratively and legally integral parts of a foreign bank, subsidiaries are separate entities.

Edge Act corporations are chartered by the Federal Reserve to engage only in international banking and financing. They are allowed to have offices in more than one state. Agreement corporations are state-chartered Edge Act corporations. All told, there were 110 Edge corporations with 47 branches at the end of 1989.

Figure 47-1
Failed and Problem Banks



Source: Federal Deposit Insurance Corporation.

Table 2: Foreign Bank Offices in the United States
(as of December 31, 1989)

Country	U.S. Offices	Country	U.S. Offices
Japan	132	Mexico	14
Canada	52	Ireland	11
United Kingdom	46	Philippines	10
France	40	India	9
Hong Kong	30	Singapore	9
Brazil	27	Thailand	9
Israel	26	Denmark	8
Italy	26	Indonesia	8
Spain	24	Colombia	7
Germany	24	Argentina	6
South Korea	24	Belgium	6
Netherlands	22	Norway	6
Switzerland	19	Pakistan	6
Australia	18	Other	79
Venezuela	18	Total	716

SOURCE: Board of Governors of the Federal Reserve System.

As the name implies, New York State investment companies are chartered in New York. They engage only in wholesale international commercial banking activities. Like agencies, the companies cannot accept deposits and they are limited to short- and medium-term lending.

In addition, there are so-called representative offices that handle no banking business but maintain contact with correspondent banks, monitor local business conditions, and serve as a contact point for clients.

Foreign Branches of U.S. Banks

Under the Federal Reserve Act, member banks must have Federal Reserve Board approval in most cases to establish foreign branches. In reviewing proposed foreign branches, the Board considers the requirements of the law, the condition of the bank, and the bank's experience in international business. In 1989, the Board approved 10 new foreign branches.

By the end of 1989, 133 member banks were operating 819 branches in foreign countries, a decline from the high of 916 at the end of 1985. Foreign branch assets grew considerably in the 1970s, reaching a peak of about $400 billion in 1983. Subsequently, foreign lending declined, falling to an estimated $264 billion in 1989.

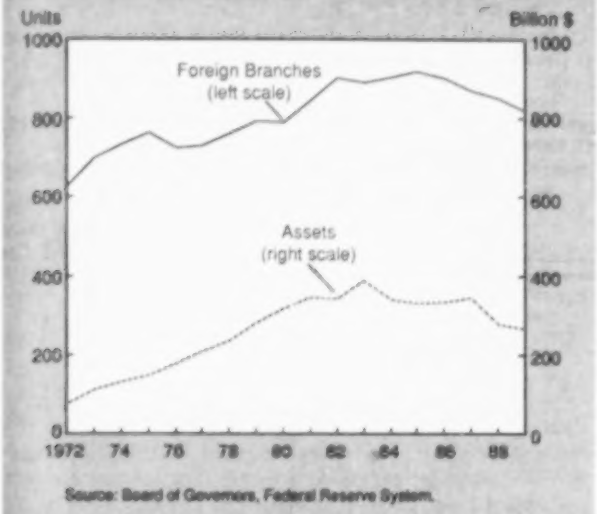
Export Trading Companies

The Bank Export Services Act of 1982 amended the Bank Holding Company Act to permit bank holding companies or their subsidiaries to invest in export trading companies. The goal is to facilitate the export of U.S. goods and services. The Export Trading Company Act amendments of 1988 gave bank holding companies additional flexibility to engage in export trading company activities. Since 1982 the Federal Reserve Board has given 47 bank holding companies the go-ahead to establish export trading companies.

International Banking Facilities

To facilitate international banking and trade, in 1981 the Federal Reserve Board permitted International Banking Facilities (IBFs) to be established in the United States. An IBF is essentially a set of asset and liability accounts that is segregated from other accounts. Deposits from and credit extended to foreign residents or other IBFs can be booked

Figure 47-2
International Banking Operations of U.S. Banks



Source: Board of Governors, Federal Reserve System.

at these facilities free from domestic reserve requirements and interest rate limits. IBFs may be established by U.S. depository institutions, Edge and Agreement corporations, and by U.S. branches and agencies of foreign banks. By the end of 1989, 533 IBFs had been established. For a full discussion of the Edge and Agreement Corporation, see Chapter 52 (Commercial Banking) in the 1990 edition of the *U.S. Industrial Outlook*.

Outlook for 1991

Following eight years of uninterrupted expansion, the U.S. economy will enter 1991 in fairly good shape, with monetary authorities striving to maintain a sustainable level of economic growth and with a wary eye on prices and the twin deficits of the Federal budget and the balance of payments. The mix between bank loans and investments will depend on how the economy performs, the stability of interest rates, and the Government's fiscal and monetary policies.

Long-Term Prospects

chnological Developments

Although still a small part of the total payment system, electronic funds transfer (EFT) is continuing its slow but steady growth as consumers make increasing use of automated teller machines. ATMs are growing in number and popularity, especially ATM shared networks, which allow a cardholder of one institution to withdraw cash and make deposits at terminals of other institutions.

Also making significant strides are point-of-sale (POS) terminals that transfer funds from a buyer's to a seller's account. However, commercial banks, other depository institutions, and retail merchants still have to work out a number of problems to achieve uniform standards, lower costs to customers, and to ensure security.

Telephone bill paying and home banking, which seemed to show great promise a few years ago, have fallen far short of expectations. After an initial burst of enthusiasm, use of personal computers in the home failed to catch on in a big way. In addition, marketing and operating the services proved to be expensive, and some of the service providers experienced financial problems. Recently, more innovative telephone bill paying and home banking services have been introduced and, along with novel marketing approaches, the services may yet attain greater public acceptance.

National Treatment Study

As part of the effort to open foreign markets to U.S. financial institutions, the 1990 National Treatment Study, mandated by the Omnibus Trade and Competitiveness Act of 1988, is under way. At least every four years, the law requires the Secretary of the Treasury, in conjunction with the Secretary of State, the Board of Governors of the Federal Reserve System, the Comptroller of the Currency, the Federal Deposit Insurance Corporation, the Securities and Exchange Commission, and the Department of Commerce to report to Congress on progress in reducing foreign barriers to U.S. financial institutions. Similar studies were conducted in 1979, 1984, and 1986.

Opening overseas markets to U.S. financial institutions is also the aim of a bill introduced in early 1990 by the chairman of the Senate Banking Committee. The Fair Trade in Financial Services Act of 1990 would give Federal regulators authority to deny applications from financial institutions in countries that discriminate against U.S. companies, and calls on the Treasury Secretary to seek fair treatment through negotiations. The Administration opposes the bill on the ground that U.S. policy is to encourage other countries to open and liberalize their markets rather than threaten to deny them access to the American market.

Nationwide Branching

To spur the growth and international competitiveness of U.S. banks, identical bills were introduced in mid-1990 in the House and Senate to allow full interstate banking and branching by 1994. The legislation would authorize the Federal Reserve to approve applications by bank holding companies to acquire out-of-state banks; permit interstate branch banking as of January 1, 1994 (but give individual states until December 31, 1993 the right to exempt themselves), and delay until January 1, 1993 renewed entry by banks into other states.

Banking and Securities Activities

Commercial banks have for years been trying to enter investment banking, initially through the discount brokerage business and more recently through the full-service brokerage business. Banking analysts predict that the industry will eventually dominate in retailing securities to individual investors because banks' costs are lower than those of many brokerage houses.

Banks are also trying to underwrite corporate debt, which is prohibited by the Glass-Steagall Act. The law, which dates to 1933, prohibits banks from affiliating with any entity that is engaged principally in the issue, flotation, underwriting, public sale, or distribution of stocks, bonds, debentures, notes or other securities. Of late, the Federal Reserve Board has approved certain new securities activities for subsidiaries of bank holding companies (BHCs), including underwriting and dealing in certain mortgage-backed securities, municipal revenue bonds, commercial paper, consumer-related securities, and corporate debt. To win Federal Reserve approval, however, BHCs are subject to substantial capital and operating restrictions. What is more, the subsidiaries can not be "principally engaged" in securities activities. Under this standard, a subsidiary can not derive more than 5 percent of its gross revenues from underwriting over any two-year period. Consequently, the securities activities of BHCs are still quite restricted.

In addition to the Federal Reserve Board, the Comptroller of the Currency and the FDIC have permitted commercial banks to expand into securities activities. And though a major banking bill is not expected to emerge before 1991, Congress eventually will have to repeal Glass-Steagall before events in the marketplace and piecemeal regulatory decisions make the law irrelevant.—*Wray O. Candilis, (202) 377-0339, August 1990.*

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Savings Institutions

A decade of economic and financial turmoil has taken its toll on the savings institutions industry (SIC 603). The number of savings institutions will continue to fall, deposits will continue to erode, and the share of mortgage originations will be lower than in the past. The remaining institutions will have a much stronger commitment to providing housing credit.

Savings institutions are in a secular decline. At the end of the 1984, they held 41 percent of the small ($100,000 or less) time and savings deposits in depository institutions and money-market mutual funds; now the figure is 33 percent and falling. In addition, 10 years ago savings institutions originated 51 percent of the permanent mortgages on one- to four-family homes. By 1990, their share had fallen to 35 percent.

There are many reasons for the industry's decline. The period of high interest rates of the early 1980s weakened many savings institutions, and some that managed to survive did so with the aid of accounting gimmickry that was both condoned and encouraged by Federal regulators.

The 1989 Financial Institutions Reform, Recovery, and Enforcement Act (FIRREA) requires insured institutions to follow much more conservative accounting rules and maintain higher levels of capital. These provisions, coupled with the inhospitable reception savings institutions have in the equity markets, leave the remaining weak institutions with three alternatives. They can find stronger merger partners, shrink to be in compliance with the new capital guidelines, or be forcibly merged or liquidated by Federal authorities.

In addition to those institutions that were weakened by interest-rate problems, a large number have failed—or likely will fail—because of ill-advised investments that will cost well in excess of $100 billion on a present-value basis to resolve. The soured investments reflect poor judgment, bad luck, and euphoric and excessive lending in the Southwest, whose economy was badly battered by declining oil prices and the collapse of the real estate market. Fraud and criminality also played a part. The situation was exacerbated by changes in the tax laws that reduced the attractiveness of investing in real estate. But overbuilding would have been a problem even without the tax law changes. There have been no failures solely attributable to credit losses on one- to four-family houses.

FIRREA's most far-reaching provision as far as the industry's future is concerned deals with the level of an institution's capital requirements. Capital, or net worth, is the owners' equity interest in the institution. Under current rules, an institution must maintain a minimum level of capital (exclusive of goodwill and intangible assets) of 1.5 percent of assets. But the level will increase to 3 percent by 1994. Almost all savings institutions are precluded from tapping the equity markets, so there are only two ways an institution that is not in compliance can increase its capital: through retained earnings or through an infusion of private equity. Both choices are unattractive because even the healthy segment of the industry is only marginally profitable.

The Office of Thrift Supervision, the principal Federal regulator of the largest segment of the savings institutions industry, categorizes firms based on their overall health, capital levels, and probability of survival. The 1,169 institutions in Group I hold 35 percent of the assets of institutions whose deposit accounts are insured by the Savings Association Insurance Fund (SAIF). Group I institutions are expected to survive and prosper. Six hundred seventy-four institutions holding 33 percent of the assets are in Group II. These are less strong but still likely to meet capital standards. The 350 institutions in Group III exhibit significant weakness because of low capital and poor earnings. These institutions hold 14 percent of the assets of

Trends and Forecasts: Savings Institutions (SIC 603)

(in billions of dollars except as noted)

Item	1987	1988[1]	1989[2]	1990[2]	1991[3]	Percent Change 1987-88	1988-89	1989-90	1990-91
Assets	1,508	1,645	1,517	1,410	1,298	9.1	−7.8	−7.0	−7.9
Mortgages held	850	927	940	910	842	9.1	1.4	−3.2	−7.5
Mortgage-backed securities	237	257	208	218	231	8.4	−19.1	4.8	6.0
Deposits	1,121	1,193	1,171	1,138	1,047	6.4	−1.8	−2.8	−8.0
Mortgages made	257	234	186	167	160	−8.9	−20.5	−10.2	−4.2
Number of institutions	3,517	3,325	3,067	2,760	2,484	−5.5	−7.8	−10.0	−10.0
Number of offices	25,500	25,946	28,492	27,067	25,443	1.7	9.8	−5.0	−6.0
Employment (ooo)	481	482	484	470	447	0.2	0.4	−2.9	−4.9

[1] Estimate

[2] Forecast.

SOURCE: Board of Governors of the Federal Reserve System, Office of Thrift Supervision, Bureau of Labor Statistics, Department of Housing and Urban Development, and Federal Deposit Insurance Corporation.

SAIF-insured institutions. Finally, the 244 Group IV institutions holding 18 percent of the industry's assets are either insolvent and awaiting placement or liquidation, in conservatorship, or expected to fail.

Group I institutions have 57 percent of their assets in residential mortgage loans, 12 percent in mortgage-backed securities, and 11 percent in liquid assets. Their tangible capital is 6.4 percent of assets on a consolidated basis—well in excess of the federally mandated minimum. However, these institutions are only modestly profitable; for example, in the second quarter of 1990 they had a profit of 70 cents per $100 dollars of assets on an annual basis.

The second most important provision of FIRREA is the qualified thrift lender (QTL) test. This requires SAIF-institutions to hold at least 70 percent of their assets in areas closely related to residential finance to be eligible to borrow from the Federal Home Loan Banks and enjoy any investment power more liberal than a national bank's. The QTL test, coupled with the generally lower capital required on one- to four-family mortgages and mortgage-backed securities, will focus the industry's activities on the origination and holding of residential mortgages. Furthermore, the law limits the amount of nonresidential mortgages a savings institution can hold.

In addition to the 2,437 institutions that are regulated by the Office of Thrift Supervision, there are 470 savings banks and cooperative banks whose deposits are insured by the Bank Insurance Fund (BIF) of the Federal Deposit Insurance Corporation (FDIC). These institutions, which make up 17 percent of the savings institutions industry, are primarily in the Northeast. They, too, have been in a long decline, and in the past 10 years their share of the deposit market has fallen from 5.5 percent to 3.5 percent. Currently, they originate only about 4 percent of permanent one- to four-family mortgages.

The BIF-insured institutions are strongly capitalized, however, with a capital-to-assets ratio of 7.7 percent. In general, they have conservative portfolio practices, and few have failed in the past 10 years. The institutions in this group have also remained healthy because of their distance from the Southwest, the large amount of capital they have, and their entrenched conservative managements. Some, however, may face difficulties in 1991 because of the real estate problems in the Northeast. Fifty-one percent of the assets of these savings banks are associated with residential finance, and the institutions are not subject to the QTL test.

The Resolution Trust Corporation (RTC), the agency charged with disposing of failed thrifts, merged relatively few failed savings institutions into other savings institutions through its first year of operation. More often than not, the RTC sold the deposit base of the failed institution to a commercial bank. As a result, the industry is contracting.

Mortgage Lending

For the first four months of 1990, SAIF-insured institutions originated $52.9 billion of mortgages, a decline of 16 percent from the $63.3 billion of the preceding year. Savings banks originated $8.9 billion over the same period, a decline of 39 percent from the year earlier.

In terms of total originations, savings and loans originate about 31 percent of home loans, 31 percent of multifamily mortgages, and 3 percent of commercial mortgages. The comparable figures for savings banks are 4 percent, 6 percent, and 2 percent, respectively. Commercial banks are the dominant originator of mortgages on nonresidential structures with a 74 percent share; and the mortgage company share of residential mortgage originations has recently increased to 28 percent, with commercial banks holding a 36 percent share of this market.

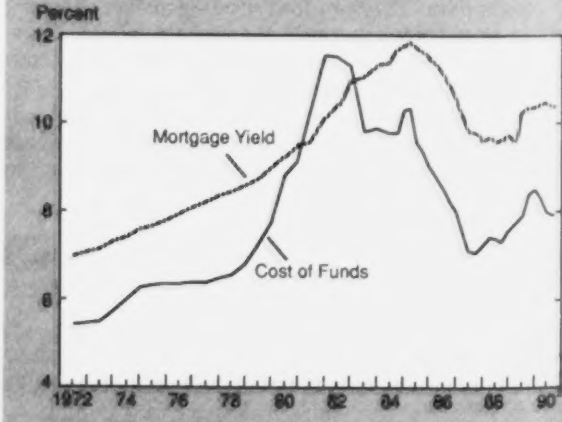
For savings institutions, the outlook for mortgage originations is clouded. For one thing, the strong demographic trends associated with the aging baby boomers will lead to some slowing of housing. For another, the new capital rules are putting pressure on the industry to retrench. What is more, the capital rules will increase participation in the residential mortgage market by commercial banks. This is because the capital requirement on a single-family mortgage is half that of an unsecured commercial loan, and the capital requirement on mortgage-backed securities is even lower. In the face of weak commercial loan demand, commercial banks will invest in mortgage assets that absorb relatively small amounts of their equity capital.

Savings institutions face increased competition in the market for residential mortgage originations, a market that is not expected to grow significantly in 1991.

SAIF-insured savings institutions are and will continue to be the largest institutional holders of residential mortgages. As of June 30, 1990, they held $540.4 billion of residential mortgages, $143.3 billion of mortgage-backed securities, and at least $17 billion of derivative mortgage securities. By way of contrast, the direct residential mortgage holdings of the commercial banking industry are only 60 percent as great. While mortgage companies and commercial banks can originate mortgages as efficiently as savings institu-

Figure 48-1

Cost of Funds and Mortgage Portfolio Yield for SAIF - Insured Savings Institutions [1]



[1] SAIF: Savings Association Insurance Fund.

[2] Data through first half of 1990 only.

Source: Office of Thrift Supervision.

tions, savings institutions have a comparative advantage in holding residential mortgages.

The proportion of new single-family mortgages with adjustable interest rates is about 30 percent. Savings institutions sell much of their fixed-rate mortgages in the secondary market. Thus, an estimated 58 percent of one- to four-family mortgages in portfolio have rate-adjustment features.

Deposit Flows

For 1989, SAIF-insured institutions experienced a deposit outflow before interest credited of $78.3 billion. The outflow continued into 1990, reaching $39.4 billion for the first four months. This outflow largely reflects planned shrinkage by institutions seeking to comply with the new capital requirements. After including interest credited, total deposits fell by $38.4 billion. In addition to the deposit outflow, borrowings from the Federal Home Loan Banks have fallen by $32.4 billion to $115.6 billion in the 12 months ended April 30, 1990, and other borrowings, principally repurchase agreements, have fallen by $46.3 billion. Deposit outflows are expected to continue in 1991.

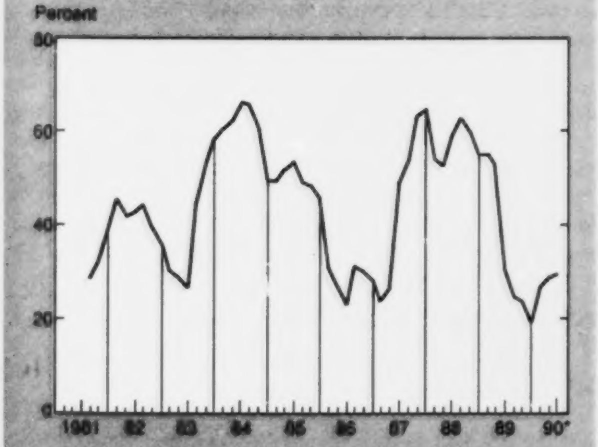
Yields and Spreads

For the second quarter of 1990, SAIF-insured institutions had a cost of funds of 7.91 percent, down from 8.38 percent the year earlier. There is considerable variation in the cost of funds—ranging from 8.21 percent in the Topeka Federal Home Loan Bank District to 7.46 percent in the Chicago District. Excluding conservatorships, the average cost of funds was 7.84 percent.

The average mortgage portfolio yield in the second quarter of 1990 was 10.35 percent, almost identical to the year-earlier yield of 10.33 percent. The average portfolio yield ranges from a high of 10.75 percent in the Seattle District to a low of 10.05 percent in the Boston District. The average return is dragged down by the many nonperforming loans of institutions in conservatorship. Excluding these institutions, the average mortgage yield is 10.47 percent. Since new mortgage rates and the rates on new deposits differ little from what is already in portfolio, no major change is expected in 1991 in either the average portfolio yield or cost of funds.

Figure 48-2

Proportion of Home Loans Closed with Adjustable Interest Rates



* Data through July 1990 only.

Source: Federal Housing Finance Board.

Outlook for 1991

Many of the 1990 trends will continue in 1991. Weak institutions will continue to be transferred to the control of the Resolution Trust Corporation for resolution or disposition. Barring a total collapse in real estate markets, there should be no major surprises in the number of institutions transferred to the RTC or their expected resolution cost. Almost all of the institutions that ultimately will fail because of asset problems have been identified and the probable cost already estimated.

The assets of the middle group of institutions whose survival is uncertain will probably diminish as they seek to economize their scarce equity capital. Healthy institutions will look more and more like the savings institutions of 20 years ago, both by choice and as a result of regulation. The healthiest institutions in 1991 are the ones with the most conservative portfolios—those dominated by one- to four-family mortgages. This specialization is now buttressed by new statutory provisions.

Long-Term Prospects

Many observers predict the disappearance of the savings institutions industry within several years. They cite the mortgage origination capability of mortgage companies and commercial banks and the mortgage investing capabilities of commercial banks and the secondary mortgage market. They also cite the narrowing of spreads caused by increased deposit-market competition and by the competitive challenges of the secondary mortgage market.

Arguments to the contrary are equally strong. First, savings institutions that specialize in residential finance can be quite profitable. This includes both multi-billion dollar institutions with interstate branch networks and community-based single-office institutions. Second, there always will be a market for residential mortgage loans because most house purchases are financed. Savings institutions remain the largest holders in residential mortgages. Third, some of the recent increase in holdings of mortgages and mortgage-backed securities by commercial banks may result from an artifact in the capital rules, which give low capital weights to such assets in spite of their inherent interest-rate risk. Lastly, the secondary mortgage market does not by itself invest in mortgages, but repackages individual mortgage loans into securities more acceptable to investors. Savings institutions make up the largest single investor class in this market.—*Joseph A. McKenzie, Federal Housing Finance Board, (202) 408-2845, October 1990.*

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Mutual Funds

Although the growth in mutual fund assets during the 1980s was interrupted by the market declines of October 1987 and October 1989, total assets grew almost tenfold during the decade, totaling more than $982 billion at the end of 1989. In early 1990, fund assets crossed the $1 trillion mark for the first time, and they continued to grow through midyear, reflecting increased fund purchases and higher prices of securities. Despite the market decline in the second half of 1990, mutual funds should continue to be a significant part of the investment strategy for millions of Americans throughout the 1990s. The industry's growth is expected to moderate, however.

The 1980s witnessed impressive growth for mutual funds, a reflection both of the increased valuation of the underlying investment portfolios in a rising market and a growing number of funds and investors.

Total fund assets grew from less than $100 billion to almost $1 trillion during the decade, while the number of shareholder accounts, both individual and institutional, grew from 10 million to 58 million. The number of funds rose from 524 to 2,918. The portion of U.S. households holding shares in mutual funds increased from approximately 6 percent in 1979 to 25 percent in 1989.

The stock market continued to reach new highs throughout the first half of 1990. The Dow Jones Industrial Average, the market's most closely watched indicator, topped the 3,000 mark on an intra-day basis on two occasions in July. Then the market receded in reaction to concerns about recession and inflation, and tumbled further as financial markets around the world reacted to the Iraqi invasion of Kuwait. As oil prices rose, fears intensified that the Gulf crisis would boost inflation worldwide and reduce U.S. and world economic growth. These concerns are likely to affect investor confidence and security prices throughout much of 1991.

In the wake of the dramatic declines in stock prices during the last few years (October 1987, October 1989, and August 1990), investors can be expected to put more emphasis on safety and income. The Middle East crisis and ensuing decline in stock prices strengthened investor interest in liquidity, safety, and security. Money-market funds, which are considered among the safest and most liquid assets, invest in such instruments as short-term Treasury securities, commercial paper, and certificates of deposit (CDs). The increase in money-market fund assets, to a record of more than $400 billion within weeks of the onset of the events in the Persian Gulf, reflects that individuals and financial institutions wanted safety following the fall-off in equity markets.

Industry Description

A mutual fund is a pool, or portfolio, of financial assets held by an investment company. The mutual fund industry consists of investment companies (SIC 6722), each of which sells shares in one or more mutual funds. Most are open-end investment companies, whose shares are sold publicly and are redeemable upon request of the shareholder. The value of the shares rises and falls with the value of the pool of assets. Essentially, shareholders rely on the investment company for a favorable return on their investment instead of operating directly in the market themselves.

Each fund is run by a manager who determines the composition of the portfolio, which may include stocks, bonds, government securities, shares in precious metals, and other financial assets selected to meet the fund's stated investment objective.

Mutual funds are commonly categorized by their general objectives. Equity funds consist mainly of common stocks and are organized primarily to achieve capital appreciation or growth, rather than to produce income. Bond funds are composed primarily of corporate, U.S. Government, or municipal bonds and emphasize regular income rather than growth. Income funds have the same objective as bond funds but include Government National Mortgage Association securities, government securities, and common and

Table 1: Trends in the Mutual Fund Industry* (SIC 6722)

(in billions of dollars except as noted)

Item	1985	1986	1987	1988	1989	June 1990
Total assets, all funds	495.5	716.2	769.9	810.3	982.0	1,034.1
Equity	116.9	161.5	180.7	194.8	249.1	270.1
Bond and income	134.8	262.6	273.2	277.5	304.8	310.5
Money market	207.5	228.3	254.7	272.3	358.7	377.7
Short-term municipal	36.3	63.8	61.4	65.7	69.4	75.8
Number of reporting funds	1,531	1,843	2,324	2,718	2,918	—
Number of shareholder accounts (millions)	34.8	46.1	54.5	54.7	58.2	—

*All statistics are as of December 31 except as noted.

SOURCE: Investment Company Institute.

preferred stocks as well as bonds. Money-market funds consist of short-term instruments such as U.S. Government securities, CDs, and commercial paper. Short-term municipal bond funds are made up primarily of tax-exempt, short-term municipal securities.

Investment companies sell shares directly to the public or through agents. Registered representatives of brokerage firms, insurance agencies, and financial planning firms, among others, sell shares in mutual funds as part of their overall financial service to clients. These funds usually add a sales charge, or "load," to compensate agents for their work and generate revenue for themselves. Organizations such as unions and trade associations also market mutual funds.

In addition, many investment companies sell fund shares directly to the public by mail and by telephone. Such funds are often sold "no load"—that is, with no sales charge or only a nominal (less than 3 percent) sales charge. About a third of mutual funds are no-load, which derive revenue from management fees based on the size of assets, performance, or both.

Mutual funds must meet strict regulatory requirements. A fund must register with the Securities and Exchange Commission (SEC), issue a prospectus giving a detailed report of its operations and objective, and adhere to exacting accounting and valuation rules. Other regulations are aimed at preventing conflicts of interest among investment company officials. Mutual funds are also regulated by state securities laws and regulations. As a result, some funds are unable to sell their shares in certain states. In short, the fiduciary nature of mutual funds makes them subject to closer scrutiny than other financial institutions.

Closed-End Funds

Closed-end funds (SIC 6726) resemble open-end funds in almost all respects but one. While open-end funds continuously offer new shares to the public and redeem, or buy back, shares on demand, closed-end funds usually have a fixed number of shares that are publicly traded. Beyond that, both types of fund provide shareholders with a professionally managed, diversified portfolio designed to reduce risk and meet specific investment objectives.

Closed-end funds have become more popular in recent years. The underwriting activity for closed-end funds climbed from less than $1 billion in 1985 to $21 billion in 1988, with much of the gain in bond funds. In 1989, the latest year for which figures are available, activity declined. During the first seven months, underwritings totaled less than $5 billion, compared with more than $13 billion for the corresponding year-earlier period. The decline is attributed to a variety of factors, including market saturation and the increased popularity of other types of investments, including open-end funds.

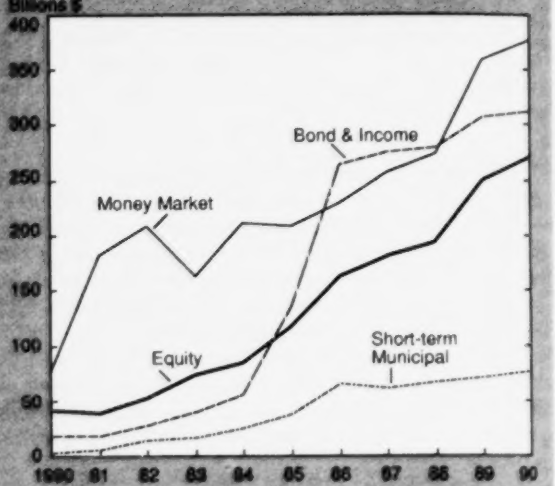
Outlook for 1991

Despite the weaker market for securities in the second half of 1990 and barring a recession, prospects for mutual funds remain upbeat for 1991. As the population continues to age, there will be more people with higher incomes and lower expenses who will want to invest for their retirement.

Long-Term Prospects

The phenomenal growth of mutual fund investing of the 1980s will not be sustained. The industry anticipates a slower but steady growth. The graying of the baby boom generation bodes well for financial service firms that can assist people save and accummulate capital for their retirement years.

Figure 49-1
Total Assets of Mutual Funds



Note: End of year and June 1990 values.
Source: Investment Company Institute.

Although there probably will be fewer new products, many mutual funds will re-package their products to appeal to specific markets. Distribution methods also will be changed to make investment easier. Electronic transactions will become more widespread, such as sales through automatic withdrawal from bank accounts and through payroll deduction. Banks will become a significant distribution channel for mutual funds promoting funds to their own customers.

The industry is designing variations in sales charges and the distinction between load and no-load funds is becoming increasingly blurred. Some load funds are reducing sales charges in response to the demands of a better informed and more cost-conscious investing public. Some previous no-load funds are including charges. Many funds have adopted 12b-1 programs, so-named for a section of securities law that allows them to use a portion of fund assets to pay for distribution and marketing.

Funds will continue to emphasize good service and cost-efficiency. In the process, funds will be forced to trim the high cost of providing those services, including large marketing and public relations efforts that tend to squeeze their profit margins. As part of the industry's goal to become more efficient and reduce operating costs, some funds are moving their transfer and shareholder relations operations in-house. Other funds will be merged, either within a company's family of funds or with outside funds, including foreign funds seeking to increase their U.S. presence.

The move toward 24-hour securities trading would not materially affect mutual funds, although special provisions would have to be made to price funds. That is because the net asset value funds use to determine purchase and redemption prices are calculated on the basis of the prices of their underlying securities at the close of each market day.

Regulatory Changes

Regulatory changes also will be forthcoming. In 1990, the SEC launched an extensive study of investment company regulation in light of developments in the financial markets since the Investment Company Act and the Investment Advisers Act were passed 50 years ago. The SEC's request for comments from the industry and the investing public brought forth such a large response that the commission was forced to extend the original deadline.

The results of the study are expected to lead the SEC to introduce many changes by mid-1991. For example, the commission will probably require funds to disclose information about persons who significantly contribute to the investment advice that funds rely on. Concerns about the safety of money-market funds will probably lead the SEC to require funds to disclose that their underlying securities are not insured, and that investors have no guaranty of getting back the full value of their investments based on the face value of the securitites in the portfolio. The SEC may also impose new limits on money-market funds' investments by, for example, prohibiting more than 5 percent of their assets from being placed in lower-rated instruments, and more than 1 percent in any one issue.

INTERNATIONAL COMPETITIVENESS

In keeping with the growing globalization of financial markets, the mutual fund industry and the SEC are working toward liberalizing international fund sales by eliminating certain barriers to effective competition. Various methods have been considered, such as amending or re-interpreting domestic legislation and entering into multinational or bilateral treaties. U.S. tax law is the single biggest impediment to U.S. funds that want to market their shares abroad. That is because U.S. funds, which are not taxed, are required to make annual distributions of capital gains and dividends to their shareholders. One possible solution is to give a more favorable tax treatment to foreign investors.

Other areas for consideration include the dissimilar structure of foreign funds, which do not always exist as separate corporate entities. Definitions of mutual funds are somewhat different, too, as are requirements for accounting and disclosure. The U.S. also requires the forward pricing of funds; that is, purchases and redemptions are based on the closing price on the day an order is placed. Some countries, by contrast, permit the purchase at the previous day's market price. Moreover, affiliated party transactions are quite commonplace abroad but prohibited in the U.S. Thus, for example, a fund could not invest in the shares of a bank whose president sits on the fund's board.

The biggest changes will likely be in international fund sales. Because of regulations and other restrictions in most countries, including the United States, it is unusual, and often illegal, for an investment company to sell fund shares in countries other than its own. International activity for U.S. investment companies has so far been limited to buying foreign securities and acting as advisers to foreign investment companies. Some funds also have established foreign subsidiaries in foreign countries. Although information on the extent of such activies is not readily available, it is believed to be slight. Interest in marketing mutual funds and other financial services is growing, however, and industry representatives continue to meet with their foreign counterparts to explore the creation of an international market for fund shares. Such a liberalized system could closely parallel the new European Undertakings for Collective Investments in Transferable Securities (UCITS), which can market their fund shares freely within the 12-member European Community (EC). UCITS, which are open-end investment companies or unit trusts, correspond in general to open-end mutual funds in the United States.

An EC directive published in 1985 is intended to facilitate the ability of UCITS registered in one EC country to market units in another member state by coordinating national laws and ensuring more effective and uniform protection of investors. Once a UCITS has been approved in one EC nation, its units can be marketed throughout the EC without further approval from other members. The UCITS remain under the supervisory control of authorities in the home country, but are subject to the marketing rules of the other members. The UCITS directive took effect October 1, 1989 for 10 members of the EC, and becomes effective for Greece and Portugal in April, 1992.

The directive makes no provision for the sale of third-country mutual funds throughout the EC. Accordingly, any U.S. fund that wants to market within the EC is required to register with the individual member nations. For their part, EC fund managers find it virtually impossible to establish funds in the United States because of strict SEC requirements mandated by the Investment Company Act. Congress could amend the law by giving the SEC authority to approve the sale of foreign funds in the United States when they are determined to meet investor protection regulations comparable to those required of U.S. funds. Once the way is opened, possibly by the mid-1990s, the internationalization of fund sales would create a competitive global environment and the opportunity for increased sales of U.S. mutual funds.—*S. Cassin Muir, Office of Service Industries, (202) 377-0349, September 1990.*

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Insurance

Premium receipts of life insurance companies will increase 8 percent in 1991, with annuities leading the way. Premiums written by property-casualty insurers will grow 6.2 percent. Despite small commercial rate increases, large underwriting losses will reduce earnings in the property-casualty industry and insolvencies will remain at a high level.

LIFE INSURANCE

Premium receipts of life insurance companies increased 8.8 percent in 1990, to $265.9 billion, the result mainly of continued strong sales of annuity and health insurance contracts and a renewed consumer interest in life products. Measured by face value, sales of life insurance increased 4 percent. Life insurance companies' assets increased 10.2 percent, to $1.4 billion, while employment remained stable at 576,300.

The life insurance industry consists of companies that underwrite life insurance and annuities; they also underwrite accident and health insurance and manage pension and trust funds. The companies are classified in SIC 631 (Life Insurance) or in SIC 632 (Accident and Health Insurance). Stock companies, which are owned by shareholders, and mutual companies, which are owned by policyholders, constitute the two main types of insurance providers. Although almost 95 percent of insurance providers are stock companies, mutual companies accounted for about 45 percent of the industry's total assets and 36 percent of the total premiums received in 1989.

Income of Life Insurance Companies

Life insurers derive their premium income from three major types of products: life insurance, annuities, and health insurance. Premium income from life insurance products dropped slightly in 1989 (Table 1). In a turnaround, however, a midyear 1990 survey showed that sales of term insurance, variable, variable universal, and whole life grew significantly over 1989. Only sales of universal life policies decreased. Sales of single-premium policies remained flat in 1990. Traditional whole-life policies made up more than half of individual life insurance sales, while universal policies accounted for another quarter. Premium income from group life, which made up 20.6 percent of all life insurance premiums in 1989, was expected to have gone up again in 1990, but to have diminished as a percentage of sales.

Term life insurance is pure protection, whereas whole life consists of insurance and savings components. A whole-life policy builds value that can be cashed in or borrowed against. Universal policies are variations of whole life that enable a policyholder to adjust premium payments and death benefits. Another type of whole life is variable life; its death benefit and cash value depend on the value of the underlying assets, such as stocks, that back the policy.

Individual and group annuities accounted for the largest portion and had the highest rate of growth of all components of life insurance companies' premium receipts in 1989. There was a particularly strong increase in sales of

Table 1: U.S. Life Insurance Company Income Selected Years, 1970–1989

(in billions of dollars)

Source	1970	1980	1986	1987	1988	1989
Total income	49.1	130.9	282.3	314.3	338.1	367.3
Total premium receipts	36.8	92.6	194.1	213.0	229.1	244.4
Life insurance premiums	21.7	40.8	66.2	76.7	73.5	73.3
Annuity considerations	3.7	22.4	83.7	88.7	103.3	115.0
Health insurance premiums	11.4	29.4	44.2	47.5	52.3	56.1
Investment income	10.1	33.9	75.4	82.9	92.0	104.0
Other income	2.1	4.3	12.7	18.5	17.0	19.0

NOTE: Totals may not add up due to rounding.
SOURCE: American Council of Life Insurance.

Trends and Forecasts: Life Insurance

(in billions of dollars except as noted)

Item	1987	1988	1989	1990[1]	1991[2]	Percent Change 1987–88	1988–89	1989–90	1990–91
Premium receipts	213.0	229.1	244.4	265.9	287.2	7.6	6.7	8.8	8.0
New life insurance purchases[3]	1,352.5	1,406.9	1,441.7	1,499.4	1,556.4	4.0	2.5	4.0	3.8
Life insurance in force[3]	7,452.5	8,020.2	8,694.0	9,476.5	10,357.8	7.6	8.4	9.0	9.3
Total benefits paid	71.4	74.1	80.2	84.2	88.8	3.8	8.2	5.0	5.5
Life insurance assets	1,044.5	1,166.9	1,299.8	1,432.4	1,572.8	11.7	11.4	10.2	9.8
Employment (SIC 6311)[4]	578.1	576.5	576.2	576.3	577.0	−0.3	−0.1	-	0.1

[1] Estimate.
[2] Forecast.
[3] Excludes foreign business.
[4] Employees on payroll only.

SOURCE: American Council of Life Insurance; U.S. Department of Labor, Bureau of Labor Statistics. Estimates and forecasts by the U.S. Department of Commerce, International Trade Administration.

individual variable annuities and annuities that qualify for certain tax benefits, such as deferrals and credits. Like variable life insurance, the value of variable annuities depends on their underlying assets. Tax-advantaged annuities include Individual Retirement Accounts (IRAs) and 401(k) salary deduction plans.

Life insurance companies are major providers of group annuities for employer-provided pension plans. Two-thirds of annuity sales come from group annuities, which had solid increases in 1989.

Premium receipts from health insurance grew in 1989. Group health policies, which are generally provided through employers, constituted about 75 percent of the $56.1 billion in health premiums that life insurers received in 1989. The percentage is diluted by the increasing proportion of group health contracts that are provided only as administrative services, under which the insurer does not assume the full risk for future claims.

Assets of Life Insurance Companies

The assets of life insurance companies consist mainly of financial instruments. These assets back insurance and annuity reserves that are legally required to pay future claims and to provide the necessary surplus and capital to meet solvency standards. This makes life insurance companies major institutional investors. Of total assets, corporate securities accounted for 51.1 percent at the end of 1989 (Table 2). Bonds have made up a significantly higher share since 1986. Policy loans as a percentage of assets decreased considerably, from 5.8 percent in 1986 to 4.4 percent in 1989. Government securities also became less significant as a component of assets. The proportion of real estate, mortgages, and other assets decreased slightly.

Table 2: Life Insurance Company Assets, 1986 and 1989

Type of Asset	1986		1989	
	Billions of dollars	Percent of total	Billions of dollars	Percent of total
TOTAL	937.6	100.0	1,299.8	100.0
Corporate securities	432.8	46.2	663.7	51.1
Bonds	342.0	36.5	538.1	41.4
Stocks	90.9	9.7	125.6	9.7
Mortgages	193.8	20.6	254.2	19.5
Policy loans	54.1	5.8	57.4	4.4
Government securities	144.6	15.4	178.1	13.7
Real estate	31.6	3.4	39.9	3.1
Miscellaneous	80.6	8.6	106.4	8.2

NOTE: Totals may not add up due to rounding.
SOURCE: American Council of Life Insurance.

Overall, life insurers were financially sound and healthy in 1990. Operating revenues were up, while operating and administrative expenses remained under control. Investment income was solid. The solvency of a few smaller companies, however, is threatened by excess investment in questionable real estate and junk bonds. Nevertheless, the incidence and threat of insolvency in the life insurance industry remains low compared with the property-casualty industry, and even more so when compared with the savings and loan industry.

Key Legislative and Regulatory Developments

The taxation of life insurance companies and their products are perennial issues at state and Federal levels, particularly as pressure grows to find new sources of revenue. Under consideration are changes that would equalize the relative amount of taxes paid by mutual and stock companies. Other proposals include limiting the deductibility of policyholder dividends, thus raising taxes on mutual companies, and basing taxes on specifically defined alternative measures of income, rather than on statutory income, as is the current practice.

Another issue is the taxation of interest income in insurance and annuity products (referred to as "inside build-up"), now subject to deferral or exemption, and the deferral of policy acquisition costs over a number of years. In addition, policymakers are debating whether to exempt from taxation premature distributions of death benefits to policyholders with terminal illnesses.

The McCarran-Ferguson Act of 1945, which left regulation of insurance companies to the states and exempts the industry from certain aspects of Federal antitrust law, forms the basic regulatory and economic framework of the industry. In 1990, for the first time ever, a bill to repeal the antitrust provisions of McCarran-Ferguson was approved by a committee in the House of Representatives. The insurance industry opposes repealing the law, which allows joint underwriting and data sharing. But a revision or repeal of McCarran-Ferguson is considered inevitable by many observers.

Another long-standing issue is the entry of banks into insurance. The industry argues that separation of powers between banking, securities, and insurance provides stability in the market and protects consumers. But proponents of greater integration of financial services argue that it would promote economic efficiency. Many states already allow state banks to sell and/or underwrite insurance. Delaware passed a law in 1990 that would have allowed state-chartered banks, even those owned by bank holding companies, to sell and underwrite insurance in any other state. But a ruling by the Federal Reserve Board in effect nullified the law.

One of the most critical issues that affects the life insurance industry is the Government response to an estimated 30 million Americans who have no health insurance. Another major problem is the long-term effect of AIDS on the industry.

INTERNATIONAL COMPETITIVENESS

As financial markets have become more global, U.S. life insurers have set up foreign branches, subsidiaries, and joint ventures. In addition to underwriting life, health, and pension products, the companies provide such auxiliary services as claims processing, investment services, and information systems. Insurers also have been active in some banking and securities markets overseas, where there are no restrictions separating such activities similar to those in the United States.

Japan, where life insurance is a preferred means of saving, had the largest life insurance market (excluding health insurance) in 1988, with $214.1 billion in premiums (Table 3). The United States was a close second, and the United Kingdom a distant third.

The extent of U.S. participation in life insurance markets around the world is reflected in Table 4. Foreign life

Table 3: World Insurance Markets[1] 1988 Premiums

(in billions of dollars)

Item	Total	Life	Nonlife[2]
Total, all countries	1,171.0	615.9	555.1
United States	431.4	176.8	254.6
Canada	26.5	12.8	13.8
Europe	349.0	169.3	179.8
West Germany	79.3	36.6	42.7
United Kingdom	69.0	40.9	28.1
France	52.2	25.5	26.6
Italy	20.0	4.8	15.2
Switzerland	15.1	8.7	6.5
Netherlands	15.1	7.3	7.8
Other	78.4	45.5	52.9
Asia	322.7	237.6	85.1
Japan	284.6	214.1	70.5
South Korea	16.5	13.7	2.8
Taiwan	4.6	3.2	1.4
Other	17.0	6.6	10.4
Latin America	8.6	1.8	6.8
Africa	12.4	7.2	5.2
Oceania[3]	20.4	10.5	9.9

[1] Includes centrally planned economies as well.

[2] Nonlife business includes accident and health insurance as well as property/casualty insurance.

[3] Includes Australia, New Zealand, and South Pacific Islands.

NOTE: Detail may not add to totals due to rounding.

SOURCE: *Sigma*, May 1990, Swiss Reinsurance Company.

insurance affiliates (branches and subsidiaries) of U.S. companies had more than $9 billion of sales (premium plus investment plus other income) in 1988. Although foreign sales of U.S. companies are small compared with the vast domestic market, foreign life insurance markets are growing faster. Canada, Europe, and Japan have been key markets for U.S.-owned life insurers (Table 5), and recently they have made significant entries into Korea, Taiwan, and other growing Asian markets.

Foreign insurance companies have greatly expanded their activities in the United States over the past few years, mainly through acquisitions, and in 1988 they accounted for an estimated 5.9 percent of total life insurance premiums. For all lines of insurance, foreign-owned companies operating in the United States received about 9.3 percent, or $40 billion, of total premiums in 1988.

Table 4: Foreign Insurance Affiliates[1] of Nonbank U.S. Parents

Item	1983	1985	1987	1988[2]
All insurance				
Number of affiliates	621	617	631	641
Total assets (mil. $)	46,896	56,381	80,353	86,025
Sales (mil. $)[3]	16,273	17,860	26,949	27,822
Life insurance				
Number of affiliates	88	87	86	89
Total assets (mil. $)	19,665	21,310	28,628	30,517
Sales (mil. $)[3]	5,913	5,622	7,794	9,036
Accident and health insurance				
Number of affiliates	34	34	39	39
Total assets (mil. $)	2,181	3,044	6,252	7,272
Sales (mil. $)[3]	856	1,046	2,119	2,570
Other insurance				
Number of affiliates	499	496	506	513
Total assets (mil. $)	25,060	32,027	45,472	48,235
Sales (mil. $)[3]	9,503	11,192	17,037	16,216

[1] Affiliates include entities at least 10 percent owned by a U.S. person.

[2] Preliminary estimates.

[3] Sales equals premium income plus investment income plus other income.

NOTE: Detail may not add to totals due to rounding.

SOURCE: U.S. Department of Commerce, Bureau of Economic Analysis, *U.S. Direct Investment Abroad*, various issues.

Table 5: Sales[1] by Foreign-Owned Insurance Affiliates, 1988

(in millions of dollars)

Country of Parent[2] Country of Sales	Foreign-owned Affiliates in the U.S.	U.S.-owned Affiliates Abroad
All countries	49,292	27,822
Canada	11,321	6,415
Europe	27,541	10,137
Switzerland	4,286	NA
European Community	22,484	NA
Netherlands	10,386	NA
United Kingdom	9,628	NA
West Germany	2,029	NA
Other	441	
Other	771	
Latin America[3]	311	5,157
Japan	300	4,146
Australia	613	NA
Other countries[4]	9,206	NA

NA - Not available.

[1] Sales equal premium plus investment plus other income for insurance affiliates that are 10 percent or more owned by any one foreign person.

[2] Country of ultimate beneficial owner (UBO).

[3] Includes offshore centers such as Bermuda and the Bahamas.

[4] Includes the United States as a UBO.

SOURCE: U.S. Department of Commerce, Bureau of Economic Analysis, *Foreign Direct Investment in the United States, Preliminary 1988 Estimates*, Table E-4, August 1990, and *U.S. Direct Investment Abroad, Preliminary 1988 Estimates*, Table 7, July 1990.

The U.S. life insurance affiliates of non-U.S. parents had sales of about $19.9 billion in 1988, up from $16.8 billion in 1987 (Table 6). These affiliates controlled about $62.4 billion in assets in 1988. Among the most prominent recent U.S. acquisitions were the $5.2 billion purchase of Los Angeles-based Farmers Group by B.A.T. Industries of the United Kingdom in 1988, which included substantial life insurance operations, and the purchase of Businessmen's Assurance Company of Kansas City by the Italian insurance company, Generali-Assicurazioni Generali, S.p.A.

The European Community (EC) is directing its members to liberalize their markets for insurance. Several EC countries have opened their life insurance sector considerably to foreign investment, and some U.S. insurers have responded by acquiring local companies and establishing new operations, particularly in Southern Europe.

Table 6: U.S. Insurance Affiliates[1] of Non-U.S. Parents

Item	1983	1985	1987[2]	1988[2]
All insurance				
Number of affiliates	148	147	NA	154
Total assets (mil. $)	53,105	67,199	110,089	139,500
Sales (mil. $)[3]	21,875	23,942	39,106	49,292
Life insurance				
Number of affiliates	41	43	NA	37
Total assets (mil. $)	23,368	33,792	53,258	62,360
Sales (mil. $)[3]	8,828	10,452	16,787	19,902
Other insurance				
Number of affiliates	107	104	NA	117
Total assets (mil. $)	29,737	33,407	56,831	77,140
Sales (mil. $)[3]	13,047	13,490	22,319	29,390

NA—Not available.

[1] Affiliates are entities 10 percent or more owned by any one foreign person. Includes branches and subsidiaries.

[2] Preliminary estimates.

[3] Sales equals premium income plus investment income plus other income.

SOURCE: U.S. Department of Commerce, Bureau of Economic Analysis, *Foreign Direct Investment in the United States*, various issues.

U.S. activity in Europe has been overshadowed, however, by European insurance companies that are consolidating their hold on the local market through acquisitions and mergers and positioning themselves for a pan-European presence. Indeed, as European insurers become larger, they also are becoming increasingly interested in obtaining a larger piece of the U.S. market through acquisition or direct entry.

The key to U.S. companies' long-term opportunities in foreign markets lies in the effectiveness of the rules and principles for trade in services being negotiated under the General Agreement on Tariffs and Trade (GATT). A successful agreement would establish multilateral rules giving signatory countries guidance on international trade and investment in services, including insurance.

Outlook for 1991

Premium receipts of life insurance companies will expand an estimated 8 percent in 1991, to $287.2 billion. Premium income from individual annuities will lead the way, with premiums for life and health insurance also showing persistent growth. Employment will remain essentially unchanged.

Long-Term Prospects

Major changes in the market may drastically alter the nature of the industry. Competition for premiums will intensify. New competition will come from other financial service firms, such as banks, which will expand their sales and underwriting capabilities if legal barriers fall. Competition will also come from foreign companies, particularly European companies, that will be looking for a larger share of the U.S. market. Finally, insurers will diversify and expand their product lines.

Demographic variables, such as income growth, wealth accumulation, population and workforce changes, and home ownership will determine the demand for pure insurance products over the long term. Life insurance products with a savings component will have to compete directly with mutual funds, time deposits, retirement savings, and other financial products. (For additional information, see chapter 49, Mutual Funds.) The rate of personal savings in the United States is expected to rise as the baby-boom generation reaches middle age, a time when people tend to save more. Consequently, the market for life insurance products will expand, although profit margins will narrow in the face of increased competition. Some companies will succeed with niche products. The most promising areas for insurers' income growth are annuities and health insurance as aging baby-boomers increase their demand for retirement plans and health insurance.

Employer and individual use of tax-deferred retirement plans will increase over the next five years. Changes in the favorable tax status of IRAs and similar plans may significantly increase the demand for individual annuities. Income generated from group annuity income will increase as employers expand pension programs and benefits—particularly defined contribution plans—for their employees.

The long-term growth in health care premiums will mostly depend on how the United States addresses national health care issues. For example, if proposed mandatory employer-provided health insurance is enacted, it will bring additional business to private health insurers. Conversely, proposals calling for government-funded health care could reduce the role of private health insurance. (For additional information, see chapter 44, Health and Medical Services.)

Life insurance companies will have to reduce costs in order to remain competitive. Pressure will be on to find less expensive distribution systems and to reduce home-office expenses. Direct-mail marketing and sales through other financial institutions, retail outlets, and fee-based agents are some alternative methods to the traditional agency system.

On top of this, the stability and solvency of the industry could be affected by the growing incidence of AIDS, further weakness in real estate markets, and an inordinate amount of high-risk junk bonds in some insurers' portfolios. The industry could be headed for a period of consolidation as noncompetitive companies are acquired. In addition, the loss of antitrust immunity from a revision or repeal of the McCarran-Ferguson Act would further tend to push marginal companies into mergers.

Diminished returns on life insurance in the United States will prompt more companies to look for other investment opportunities. Many life insurance companies have already moved—or will move—into related financial services, including securities, banking, and real estate. More companies will also take advantage of expanding foreign markets, especially in Europe and Asia.

PROPERTY CASUALTY INSURANCE

Net written premiums for property-casualty (P/C) insurance companies grew 4.4 percent in 1990, to $217.6 billion. The downward trend in commercial rates since 1987 leveled off in 1990, but adequate capacity and tough competition kept most rates from rising despite large increases in incurred losses. Coupled with a small increase in investment income, operating earnings after taxes declined sharply, to $5.6 billion. Asset growth slowed, while employment expanded 2 percent, to 557,200 in 1990.

The property-casualty insurance industry consists of companies that underwrite insurance protection for individuals, commercial businesses, and others against losses of real and personal property or losses by third parties for which the insured is liable. P/C insurance companies are classified in SIC 633, (Fire, Marine, and Casualty Insurance,) or in SIC 632, (Accident and Health Insurance). There are an estimated 3,800 P/C insurance companies in the United States. Some are stock companies owned by stockholders, and some are mutual companies owned by policyholders.

Automobile insurance is the single largest source of premium income for P/C insurers, accounting for 43.6 percent of net written premiums in 1989 (Table 7). About 80 percent of automobile premiums written were from individual policyholders. Other major sources of premiums written are workers' compensation, liability lines, homeowners' multiple peril, and commercial multiple peril. Decreases in premiums written for liability insurance in 1988 and 1989 were due mainly to the rate cutting that followed sizable increases in the tight market of 1985 and 1986. Growth in premiums written for automobile insurance and workers' compensation relative to most other lines of business continued in 1990, although these lines also represented the biggest areas of underwriting losses for insurers.

Trends and Forecasts: Property/Casualty Insurance

(in billions of dollars except as noted)

Item	1987	1988	1989	1990[1]	1991[2]	Percent Change 1987-88	1988-89	1989-90	1990-91
Net written premiums	193.2	202.0	208.4	217.6	231.1	4.6	3.2	4.4	6.2
Underwriting gain (loss)	(7.1)	(8.4)	(16.5)	(23.1)	(30.0)	18.3	96.4	40.0	29.9
Net investment income	24.0	27.7	31.2	31.4	32.6	15.4	12.6	0.6	3.8
Operating earnings after taxes	11.0	12.9	9.1	5.6	1.7	17.3	−29.5	−38.5	−69.6
Assets	426.7	476.9	527.0	559.8	592.3	11.8	10.5	6.2	5.8
Policyholders' surplus	104.0	118.2	134.0	138.5	140.1	13.7	13.4	3.4	1.2
Employment (000) (SIC 633)	526.2	540.2	546.1	557.2	561.4	2.7	1.1	2.0	0.8

[1] Estimate.

[2] Forecast.

SOURCE: A. M. Best Company, *Best's Aggregates and Averages*; U.S. Department of Labor, Bureau of Labor Statistics. Estimates and forecasts by U.S. Department of Commerce, International Trade Administration.

Table 7: Net Written Premiums by Major Lines of Business, 1986–89

(in billions of dollars)

Item	1986	1987	1988	1989
Total, all lines	176.6	193.2	202.0	208.4
Automobile, total	73.4	81.2	86.4	90.9
Auto liability	44.1	49.2	52.5	56.0
Auto physical damage	29.3	32.0	33.9	34.8
Liability other than auto	22.9	24.9	23.1	22.7
Fire and allied lines	6.9	7.7	6.9	7.0
Homeowners' multiple peril	15.2	16.7	17.1	17.7
Commercial multiple peril	16.2	17.2	17.7	17.5
Workers' compensation	20.4	23.4	26.1	28.2
Marine, inland and ocean	5.1	5.5	5.5	5.6
Accident and health	2.9	3.8	4.7	4.6
Other lines	13.6	12.8	14.5	14.2

NOTE: Data may not add to totals due to rounding.

SOURCE: A.M. Best Company, *Best's Aggregates and Averages*.

The growth of reinsurance was expected to have been flat in 1990 after two years of decline. Reinsurance is insurance that insurance companies purchase to reduce, or spread, some of the risk they assume. In 1989, about $21.4 billion worth of reinsurance premiums was written. Foreign-based reinsurers assumed $8.6 billion of this business (Table 8). The decline in reinsurance since 1987 has been due mostly to the current soft market and to increased risk retention by direct insurers.

Key Developments in 1990

Government regulation and control of the insurance market was the central theme of developments in the property-casualty industry in 1990. Solvency concerns captured most of the attention of state regulators, Federal lawmakers, and industry officials.

Nothing disrupts an insurance market more than insurers that are unable to meet legitimate claims. The incidence and severity of insolvencies has increased greatly since 1984, although the situation is not as critical as the problems in the savings and loan industry. Since June 1969, more than $3.3 billion has been paid out by state guaranty funds to make up for the unpaid liabilities of bankrupt insurers, the bulk since 1984. Because these payments are charged to solvent insurers, they diminish the financial soundness of the whole industry.

Table 8: U.S. Trade in Insurance

(in millions of dollars)

Item	1986	1987	1988	1989
Primary insurance premiums:				
Exports[1]	2,700	2,823	3,157	3,365
Imports[2]	954	1,208	1,112	1,075
Reinsurance premiums:				
Exports[1]	1,714	2,009	1,862	1,722
Imports[2]	6,263	7,330	7,875	8,629
Balance of payments for insurance net of losses	−231	−946	−986	564

[1] Premium receipts of U.S.-based insurance companies from foreign-based insureds.

[2] Premium payments of U.S.-based insureds to foreign-based insurance companies.

SOURCE: U.S. International Transactions Data, U.S. Department of Commerce, Bureau of Economic Analysis.

A 1990 congressional investigation found that the number of insolvencies could increase if nothing is done to address the problem. The report questioned the adequacy of state regulation and suggested Federal oversight might be needed.

The National Association of Insurance Commissioners, representing state regulators, has been pressing for tighter state rules to curb perceived industry abuses. Many insurers, mostly the larger ones, and some industry trade associations now believe the Federal Government may have to take a larger role in setting financial standards to protect policyholders. Another idea under discussion is a type of Federal guaranty similar to deposit insurance for banks.

Pressure to end the industry's antitrust immunity comes mainly from consumers who believe insurance, particularly automobile insurance, is too costly and too difficult to obtain. In California, Proposition 103, passed in 1988, required insurance companies to roll back P/C insurance rates 20 percent and removed state antitrust exemptions, although these requirements have been mitigated by the courts. Other states, such as New Jersey and Pennsylvania, have passed similarly motivated measures. In response, many insurers have curtailed affected lines of insurance or pulled out of certain states or lines of business altogether.

Growing antitrust concerns have prompted industry and the state regulators to stop insurance rating bureaus, such as the Insurance Services Office (ISO) and the National Council on Compensation Insurance, from issuing advisory rates that industry critics interpret as a form of price fixing. In 1990, the ISO began replacing advisory rates for some lines of insurance with historical loss information. As a result, insurance companies will have to calculate and file their own rates.

The so-called liability crisis of the mid-1980s, when many businesses were unable to obtain or afford liability insurance, has eased. But the fear is that the next downturn of the insurance market will lead insurers to restrict coverage, and that rates will escalate once again.

The insurance industry continues to support changes in tort law that it hopes will provide more certainty in the conduct of litigation. During the past several years, most states have enacted legislation to address one or more of the perceived problems with their tort litigation system. Product liability remains a particular problem because goods

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Premiums written by property-casualty insurance companies will rise 6.2 percent in 1991, with auto insurance the biggest component.

move in interstate commerce while the controlling laws vary by state. This creates uncertainty for both sellers and buyers of manufactured goods.

Again in 1990, Congress worked on legislation that would provide some national uniformity in product liability by abolishing joint and several liability for noneconomic damages; set a two-year statute of limitations for bringing suits; and encourage the use of pretrial settlements and other alternative means of settling disputes.

Many businesses and other organizations have responded to the availability and affordability problems by self-insuring. Others have formed wholly-owned captive insurance companies, separately capitalized, to fund employee health care or workers' compensation. Catastrophic coverages in these areas, however, usually are placed in the traditional market. A 1990 survey estimated that risk financing alternatives amount to almost 30 percent of the P/C insurance market, with self-insurance accounting for two-thirds of the alternative market and other alternatives, such as group captives, comprising the rest.

To provide another means of risk financing, the Risk Retention Act of 1981, as amended in 1986, facilitates the formation of risk retention groups and purchasing groups. A risk retention group is capitalized by its members and state-licensed to provide liability coverage to its members. Purchasing groups are formed to buy group insurance from a commercial insurer at a discount.

The Secretary of Commerce recommended several amendments to Congress in 1989 to improve operations for groups formed under the act. A principal change would clarify the treatment of purchasing group insurers, allowing them to buy insurance without burdensome regulation. The amendment would also provide safeguards to assure that insurance providers are capable of meeting their financial responsibilities.

In 1990, it was reported that there were 69 risk retention groups, compared with 62 groups with an estimated $399 million of premiums written in 1989. There were 337 purchasing groups that reportedly had premiums written of $575 million in 1988. Environmental impairment, medical malpractice, and product liability are common areas of coverage by risk-retention and purchasing groups.

INTERNATIONAL COMPETITIVENESS

The U.S. property-casualty insurance market is the largest in the world. As shown on Table 3, the United States accounted for almost 46 percent of worldwide premiums in 1988, followed by Japan with 12.7 percent. (The nonlife market on Table 3 includes health insurance premiums and P/C premiums.)

Table 6 shows that the sales (premium income plus investment income plus other income) of U.S. nonlife affiliates of foreign direct investors totaled slightly less than $29.4 billion in 1988. This is a substantial increase from $13.5 billion in 1985. It is estimated that foreign-owned P/C insurance companies accounted for 13 percent, or about $26.0 billion, of P/C premiums written in the United States in 1988. For all lines of insurance, foreign-owned companies received about 9.3 percent, or $40 billion, of premium receipts in the United States in 1988.

GEICO/Government Employee Insurance Company

Despite growing losses from claims, stiff competition will keep property-casualty rates from rising in 1991.

Table 5 shows that Canada, the Netherlands, and the United Kingdom had the most active U.S. insurance affiliates in 1988. The foreign-owned share of the U.S. market is expected to increase substantially. In 1989, BAT Industries of the United Kingdom acquired the Farmers Group, the tenth largest P/C insurance group in the United States, with $4.7 billion of premium income in 1989. In a deal expected to be consummated in early 1991, Europe's largest insurance company, the Allianz Group of Germany, will purchase Fireman's Fund Insurance Company, the 23rd largest P/C insurance company in the United States,

Foreign P/C insurance affiliates of nonbank U.S. parents had $16.2 billion of sales in 1988 (Table 4). This was down slightly from $17.0 billion in 1987. Europe and Canada were the largest sources of foreign business for these affiliates, although Japan and Latin America were also important markets for U.S. insurance affiliates abroad (Table 6).

Several events have enhanced the prospects for U.S. insurance companies to expand into international markets. In 1986, Korea and Taiwan opened their domestic insurance markets to American insurance companies, and many U.S. P/C insurers have opened offices in these and other Asian countries. In addition, a multilateral framework for trade in services is being negotiated under GATT. A successful agreement would create worldwide opportunities for all U.S. insurance companies.

The European Community holds great promise for property-casualty insurance companies. Insurers in one EC country will be able to write certain business in any other EC country. In addition, the EC has issued a directive that partially standardizes product liability laws among its members. Some U.S. insurers have already positioned themselves to take advantage of the business opportunities in the EC.

Outlook for 1991

Net written premiums for property-casualty insurance companies will increase 6.2 percent in 1991, to $231.1 billion. Commercial rates will begin to rise late in 1991 if the current soft market ends. However, rates will not rise enough to offset growing losses from claims. Thus, underwriting losses will reach new levels. Investment income will grow little, barely keeping insurers' overall operating earnings positive. Asset growth will be below normal because of poor earnings. Some P/C companies will experience severe financial difficulties and the incidence of insolvencies will remain high, but manageable.

Long-Term Prospects

After they begin to rise, rates for commercial insurance will continue to rise for a couple of years. Competition in the industry will keep rates from rising too fast or too far. In addition, insurers will be reluctant to raise rates too much, lest they produce a public backlash. Expectations are that rates will rise modestly across most lines of business rather than in selected lines, as happened during the liability crisis. The movement to alternative methods of risk financing will dampen growth in the industry and increase the relative amount of catastrophic risk carried by P/C insurers. Ultimately, this could affect the solvency of the industry.

Competition from foreign insurance companies will increase. Many foreign companies already compete in the U.S. reinsurance or surplus lines market, or both. As the EC insurance market consolidates, European insurers will move even more strongly into the U.S. market, primarily through acquisitions.

Market liberalization in the EC offers U.S. property-casualty insurers the biggest opportunity to expand overseas. American insurers also will expand into Asian as well other foreign markets. A global economy with increasing international trade and investment and with large and growing multinational companies will require insurance companies that have a worldwide presence.

The prospect for some form of federal regulation will increase in the next few years, especially if solvency problems grow. The insurance industry also will be affected by how such major problems as escalating health-care costs are resolved.—*M. Bruce McAdam, Office of Service Industries, (202) 377-0346, September 1990.*

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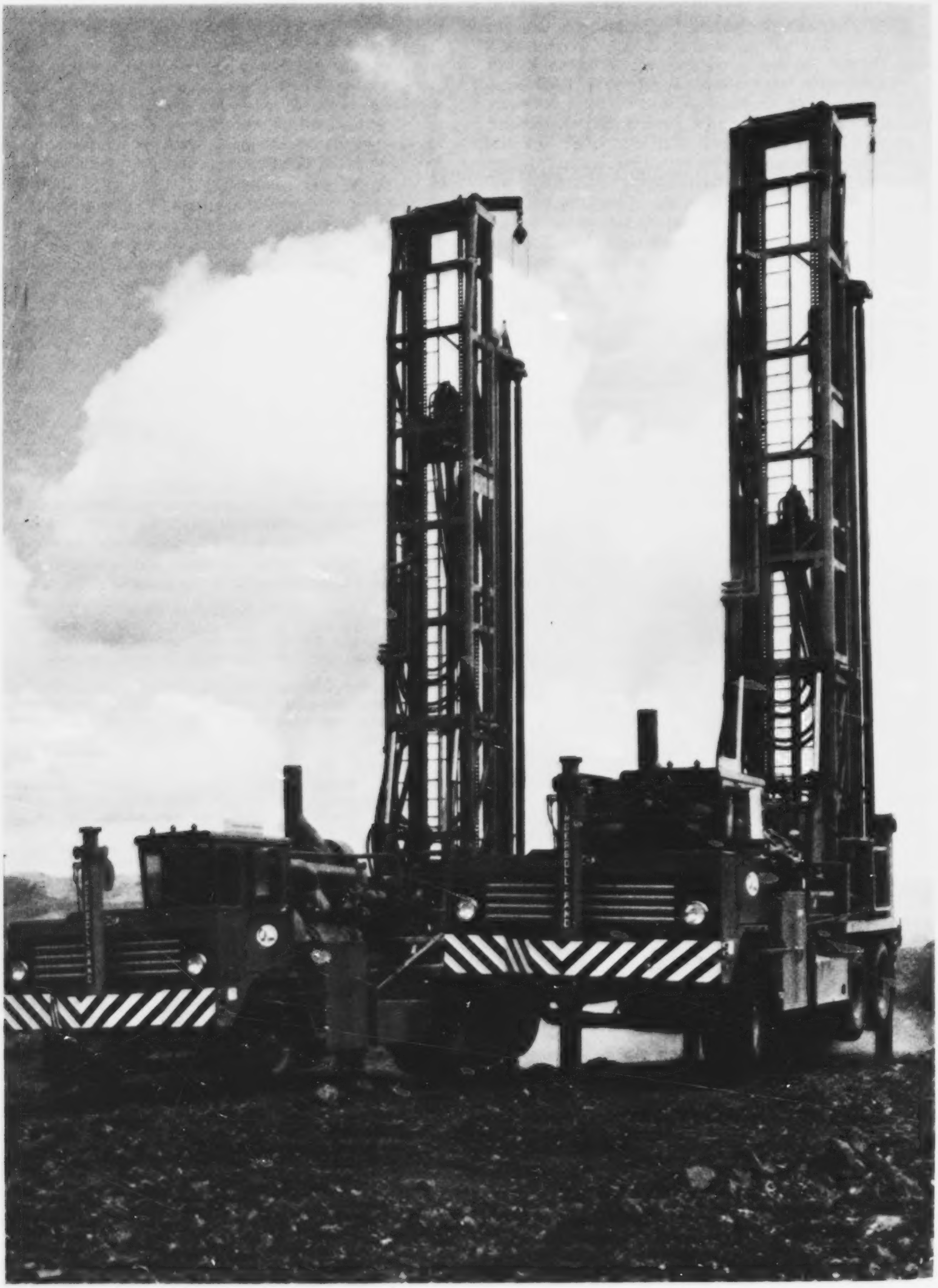
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Equipment Leasing

Equipment leasing will increase an estimated 8.1 percent in 1991 to approximately $143.7 billion. Varying growth among equipment types will push the overall industry upward. The industry will be more service-oriented and the emphasis will be on new product development. Consolidation, foreign investment, globalization, and competition will shape the industry in 1991.

Equipment leasing grew in 1990, reflecting an increase in capital equipment expenditures for the year. Leasing volume, measured by original cost of the equipment, is estimated at $132.9 billion, compared with $122.5 billion in 1989. Since 1985, leasing has grown almost twice as fast as overall business investment in equipment.

According to an industry survey, growth in 1989 was led by strong demand for the leasing of medical, office, construction, and industrial equipment. Other significant markets were for railroad equipment and electrical power generation equipment. Although the percentage of new leasing of computers and aircraft declined relative to other types of equipment, the two sectors continued to make up the largest market for leasing companies.

Before reading this chapter, please see "How to Get the Most Out of This Book" on page one. It will clarify questions you may have concerning data collection procedures, factors affecting trade data, forecasting methodology, the use of constant dollars, the difference between industry and product data, source and references, and the Standard Industrial Classification system (SIC). For other topics related to this chapter, see chapters 5 (Construction), 20 (Computer Equipment and Software), 22 (Aerospace), 21 (Electrical Equipment), 46 (Medical and Dental Instruments and Supplies).

The Leasing Industry

The equipment leasing industry consists of professional leasing companies that lease or arrange the lease of personal property, usually on a long-term basis, and supply all or a portion of the financing. To a great extent, lessors, as owners, tend to base a lease on the productive capabilities and value of the equipment rather than on the general creditworthiness of the lessee.

The leasing industry as discussed here does not include firms engaged exclusively in real estate leasing or short-term equipment rentals. Because leasing companies are classified in many different industries, aggregate data on leasing are limited. The U.S. Department of Commerce recently began to include questions on leasing activity in economic censuses and investment surveys. Accordingly, more precise data on the extent of leasing and its effect on capital investment should be available in the future.

The vast majority of lessees are business concerns, accounting for an estimated 94 percent of all lease transactions. Public utilities and municipal governments each account for about 2 percent of all leasing.

The two basic types of lease are the finance lease and the operating lease. Generally, if ownership of the leased property transfers to the lessee at the end of the lease term, following payments that represent the full value of the property, it is a finance, or full-payout, lease; otherwise, it is an operating lease.

In a direct-financing or single-investor lease, the lessor provides 100 percent financing for the equipment. About 65 percent of equipment leasing is of this type. The equipment under direct finance leasing has changed little in recent years. On the basis of original equipment cost, computer equipment dominated, representing roughly 20 percent of the total. Office machines were the next highest category, representing approximately 13 percent.

A leveraged lease involves third-party investors who provide debt funding in addition to the lessor's equity—usually 20 to 40 percent of equipment cost—for the initial financing of the property. Leveraged leasing is used extensively to finance the purchase of big-ticket items such as aircraft, oil rigs, and railway equipment. It accounts for approximately 20 percent of the value of all equipment

Trends and Forecasts: Equipment Leasing

(in billions of dollars except as noted)

Item	1986	1987	1988	1989	1990[1]	1991[2]	Percent Change 1988-89	Percent Change 1989-90	Percent Change 1990-91
Equipment leasing[3]	85.0	98.0	112.7	122.5	132.9	143.7	8.7	8.5	8.1
Business investment in equipment[4]	296.2	311.2	348.4	365.7	385.4	404.3	5.0	5.4	4.9

[1] Estimate.

[2] Forecast.

[3] International Trade Administration (ITA) estimates of original equipment cost added through leasing based on survey data from the American Association of Equipment Lessors, except as noted.

[4] Private nonresidential investment in producers' durable equipment.

SOURCE: American Association of Equipment Lessors; U.S. Department of Commerce, Bureau of Economic Analysis. Estimates and forecasts by ITA.

leases. Operating leases, accounting for about 15 percent of new business, are usually for much shorter terms and can sometimes be canceled at the option of lessees.

Operating leases also can include maintenance and service provisions. The recent reduction of tax benefits for equipment ownership has made full-service leasing a more attractive alternative for many equipment users.

Following historical trends, aircraft and electrical power generation equipment were the predominant equipment types in the leveraged lease market in 1989, representing more than 60 percent of the total. Railroad equipment, which nearly doubled from the previous year, now accounts for more than 12 percent of asset types under leverage lease.

In the wake of the Tax Reform Act of 1986, leveraged leasing transactions declined when leasing companies abandoned the field because of low profit margins and the loss of the investment tax credit. Now, however, these companies are re-entering the market to structure deals on such big-ticket items as aircraft and electrical power generation equipment.

Almost 50 percent of all operating leases are for computers. Strong increases in operating leases were evident for rail equipment. But the percentage of operating leases for aircraft dropped from 1988 to 1989.

There are four basic types of leasing companies: banks or bank-affiliated firms; leasing subsidiaries of equipment manufacturers, called captives; independents; and others, such as insurance companies, investment bankers, and independent brokers who bring the parties of a lease together. Several hundred firms engage in leasing as a primary activity, and many more are involved in leasing as a secondary activity.

Banks and bank related firms have dominated the finance lease markets for the past two decades. Despite a banking law that since 1987 has allowed banks to engage in operating leases, they have not moved strongly into this area. Other players in the leasing business are so-called captives, essentially financial arms of parent companies; and independent leasing companies that range from small specialized firms to large diversified companies that offer a full range of products for lease and sale.

A key advantage of leasing is that it permits 100 percent financing, which is particularly appealing to cash-poor companies. In addition, accounting rules may enable a lessee to classify lease payments as expenses rather than as liabilities, thereby maintaining debt capacity. A lessee also can structure an acquisition with the desired balance of equity and debt without hurting debt capacity. Finally, a short-term operating lease protects the lessee against obsolescence by shifting more of the risk to the lessor. The lessee also saves the cost of disposal or sale of the equipment if possession reverts to the lessor when the lease expires.

Tax reform has had a significant effect on tax-oriented leasing. The 1986 act eliminated the investment tax credit (ITC), modified depreciation allowances, lowered corporate tax rates, and strengthened the corporate minimum tax. The net effect is that the new law reduces the tax benefits of lessor ownership of equipment. This diminishes the advantages of leasing for lessees without taxable income. Also, the alternative minimum tax (AMT) has enhanced leasing for equipment users, so companies that are subject to the AMT may find it advantageous to lease rather than to buy equipment.

In recent years, cash-strapped states have begun looking for new source of revenue to make up for the loss of federal revenue sharing. Some are now eyeing equipment leasing and other service industries for new taxes. In addition, eight states have now adopted UCC Article 2A, which amends the Uniform Commercial Code to include leasing of tangible personal property. The idea is to bring a degree of legal certainty and predictability to lease transactions throughout the states. To comply with the statute, leasing company legal documents will require some modification. Additional states are expected to enact UCC Article 2A in the future.

The leasing industry is constantly changing. Increasingly, leasing is viewed as only one of several means of asset financing. Leasing companies are beginning to move into other aspects of structured asset finance. Large, independent financial services firms are funding high-debt, high-risk projects that federal regulators are pressuring banks to avoid. In addition to issuing senior debt, some leasing companies are also providing venture capital and arranging limited partnerships. In the case of some lessor conglomerates, conventional leasing accounts for only 30 to 40 percent of revenues.

INTERNATIONAL COMPETITIVENESS

Leasing in international markets is an important source of business for U.S. lessors, especially for large leasing companies. Cross-border leasing, in which lessor and lessee are in different countries, is a substantial part of the international market for aircraft, ships, containers, energy equipment, and other big-ticket items. Japanese lessors with abundant low-cost funds are significant cross-border lessors, often of U.S. equipment.

Many banks, manufacturers, and independent lessors have foreign leasing operations. Most have foreign subsidiaries, joint ventures, or foreign sales corporations to conduct international operations. Also, more countries are creating favorable regulatory environments for leasing as they come to recognize its benefits. The Unidroit Convention on International Finance Leasing is an example of efforts to reduce the differences in legal treatment of leasing across borders.

Globalization is becoming important for lessors. Many U.S. corporations are looking for their continued growth to come from overseas operations, not from the domestic market. U.S. leasing operations overseas have been modest during the last several years because returns on investment have been better in the domestic market, but changes in the U.S. economy and EC92 are compelling leasing companies to move more vigorously into Europe. EC92 is the merger of the economies of 12 Western European countries, which constitute a single market of 325 million people with a Gross Domestic Product of $4.5 trillion in 1988. The U.S.-Canada Free Trade Agreement and the possibility of a similar accord with Mexico also offer potential new opportunities.

In 1990, foreign investors appear to have either taken over or have become minority partners in some large, traditionally American-owned leasing firms. And large European and Japanese banks have become major direct competitors in the U.S. leasing market. Foreign capital infusion and euromarket borrowing should enable U.S.

lessors to continue funding at competitive rates despite tightening domestic credit.

U.S. leasing companies' main advantage over their foreign competition lies in their ability to create new and innovative financial products. Some companies have used the programs of the Export-Import Bank of the United States and the Overseas Private Investment Corporation to support the lease export of U.S. equipment. The programs are one reason that leasing is becoming a more common method of financing internationally.

Outlook for 1991

Overall equipment demand should grow by 4.9 percent in 1991. Leasing volume once again will follow this growth pattern, increasing 8.1 percent to $143.7 billion in original equipment cost. Rates of leasing growth will vary among equipment markets, but demand for the leasing of computers, aircraft equipment and other hi-tech equipment will remain strong. Even with the possibility of a drop in equipment investment, demand for leasing, which is somewhat countercyclical, should increase both absolutely and relative to other means of equipment acquisition.

Mergers and acquisitions of leasing companies over the past couple of years will continue to shrink the number of players. A report on the views of prominent industry executives stated that consolidation will continue because larger firms can achieve cheaper funding and better economies of scale. Eventually, the report says, the industry will consist of a number of very large organizations focusing on global operations and a number of relatively small firms filling niche markets.

Continued stiff competition will encourage the more entrepreneurial lessors to develop innovative financial products and explore growth opportunities in financial service businesses other than leasing. By emphasizing value-added service and pursuing a more customer-focused strategic direction, some lessors will be able to differentiate their products. Growth will depend largely on effective equipment management and remarketing. In many cases, equipment management can provide the value-added services necessary to differentiate a leasing company from its competition.

Foreign investment will play an important role in 1991, as leasing companies turn to foreigners for capital. U.S. leasing companies will also keep looking overseas, particularly Europe, for new clients and new investments.

Specific developments and opportunities will stimulate much of the growth in the industry in 1991 and beyond. For instance, organizations that have relied on government grants for purchasing equipment outright are turning to leasing as an alternative. Health care facilities are especially interested in operating leases for high technology items with short life expectancies.

Pending environmental legislation also will open new markets for lessors. For example, leasing companies could provide a significant portion of the financing that may be needed to overhaul up to $50 billion of equipment to comply with new environmental standards. However, the pending legislation could be a doubled-edged sword. That is because lessors with older equipment that does not conform to proposed environmental standards may have to bear the expense of updating their inventories.

American Association of Equipment Lessors

Construction machinery is among the many types of equipment available from the equipment leasing industry. Environmental legislation, now pending, is expected to open new markets for equipment lessors.

The recent curtailment of the junk bond market bodes well for equipment leasing companies. In the mid- to late-1980s, junk bonds pushed leasing aside as a method of financing equipment. Now, companies that previously leased equipment and then switched to junk-bond financing will turn again to leasing.

Long-Term Prospects

The next three to five years will see a modest growth in equipment leasing. Historically, growth in leasing has depended on overall equipment investment. Rates of growth vary by industry or business, but manufacturing, medical, data-processing, communications, and aircraft and other transportation sectors are expected to be strong. Leasing will continue to be most attractive in the hi-tech areas, though there will be opportunities in other sectors as well.

Growth will be fragmented, depending on the specific market, lease product, and transaction size. Providing superior or different services and taking more risk will be a strategic option for the more entrepreneurial lessors. The industry will move more toward offering lease products that involve a range of financing, accounting, servicing, and risk-sharing characteristics. The focus for lessors will not be whether equipment leasing is becoming a mature industry, but which products are maturing and what it will take to maintain vigorous growth for specific leasing products.

Local and regional finance companies will focus on small-ticket leasing for local equipment markets. Lease financing programs to assist manufacturers will become more prevalent, and captive lessors will concentrate more on the products of their parent companies.

Leasing has become a global industry. Foreign opportunities for U.S. lessors will increase during the next several years, but foreign leasing companies will continue to enter the U.S. market, predominantly through the full or partial acquisition of established leasing companies.

Conditions in the industry remain fluid with consolidations continuing—albeit at a slower pace—in the foreseeable future. Many factors will influence the industry over the next few years, including overall economic conditions, tax policy, and accounting rules.—*M. Bruce McAdam, Office of Service Industries, (202) 377-0346, September 1990.*

Additional References

American Association of Equipment Lessors, 1300 17th Street N., Arlington, VA 22209. Telephone: (703) 527-8655.

Equipment Leasing, Practicing Law Institute, 810 Seventh Avenue, New York, NY 10019, 1988. Telephone: (212) 765-5700.

Asset Finance & Leasing Digest, Euromoney Inc., 24th floor, 2 Park Avenue, New York, NY 10016. Telephone: (212) 696-1223.

World Leasing Yearbook 1990, Euromoney Inc., 24th floor, 2 Park Avenue, New York, NY 10016. Telephone: (212) 696-1223.

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Professional Services

Significant growth is expected in the demand for professional services in 1991 and well into the 1990s.

Before reading this chapter, please see "How to Get the Most Out of This Book" on page 1. It will clarify questions you may have concerning data collection procedures, forecasting methodology, and sources and references.

Professional services, as defined herein, include accounting, auditing and bookkeeping services; advertising services; executive search services; legal services; and management, consulting, and public relations services.

The factor that separates professionals from other employees is their utilization of formal bodies of knowledge. Sectors that employ many professionals depend on the productivity of knowledge workers, the evolution of formal knowledge systems, and the movement of knowledge into practice.

Professional work involves the application of expertise to specific cases or projects. Because the expertise resides with the employee, and because the work is generally nonrepetitive, managers delegate a significant amount of authority to the professional subordinate, and engage almost exclusively in organizational strategy and intermediation.

The dynamic nature of professional conceptual systems further differentiates professional industries from the rest of the economy. Technical development is the primary catalyst, although the direction of change is unpredictable. Technological developments, competitive pressure, and the increasing sophistication of many user companies have also expanded the range of and demand for professional services.

Professional services have a fragmented industry structure; concentration varies considerably among the many subsectors. At one end of the scale, large multinational firms dominate the market, while at the other end are specialized small- to medium-sized companies.

Professional services have grown faster than the economy in the last 10 years and are expected to maintain that position. Part of the growth is due to the externalization of many business functions, that is, contracting out for specialized services.

Although data on production and employment are limited because of difficulties in assessing services activity, conservative estimates suggest that total receipts in this sector probably exceed $236.4 billion, with employment at 2.5 million. These figures are rough estimates drawn from a variety of sources, and do not represent a consistent measure across all subsectors.

INTERNATIONAL COMPETITIVENESS

The United States is competing with Japanese and European companies for EC92 contracts in advertising, public relations, and management consulting, especially in information systems. EC92 is the merger of 12 Western European countries, which constitute a single market of 325 million people with a Gross Domestic Product of $4.5 trillion and a per capita income of $13,770 in 1988. Although not expecting to be fully operational until 1992, the EC member countries are already gearing up for competition with other world markets.

Japan in particular is aggressively pursuing EC92 consulting contracts in advertising and information systems. U.S. legal firms are also making major efforts to become involved in the European community. U.S., European, and Japanese firms will also be competing to provide auditing and accounting services to the emerging private sector in Eastern Europe. Many companies are gaining access to foreign markets by buying out or establishing joint ventures with local firms. Because foreign markets are less saturated than U.S. markets, they have more growth potential, and will grow at a faster rate than the U.S. market.

Asia is also exhibiting an increased demand for professional services. Countries besides Japan that show growth potential include Taiwan, South Korea, and members of the Association of Southeast Asian Nations (ASEAN): Brunei, Indonesia, Malaysia, the Philippines, Singapore, and Thailand.

Long-Term Prospects

Professional services will continue to expand rapidly through 1995 and should maintain significant growth throughout the decade. Increased use of high-technology equipment and integrated systems will boost productivity.

Accounting, Auditing, and Bookkeeping Services

The accounting, auditing, and bookkeeping services industry consists of establishments providing those activities.

Receipts for accounting, auditing, and bookkeeping services for the 69,773 establishments with payrolls identified in the *1987 Census of Service Industries* reached an estimated $37.5 billion in 1990, an increase of about 12.6 percent from the previous year. The industry had approximately 540,000 employees on the payroll in 1990, up 3.9 percent from 1989.

This industry is comprised of a variety of providers: sole practitioners, and small, medium, large, and multinational partnerships. Several large multinational CPA firms dominate the industry and account for much of the revenue.

Table 1: 1989 Revenues of the "Big Six" CPA Firms

(in millions of dollars)

Firm	Worldwide	U.S.
KPMG Peat Marwick	4,300	1,770
Ernst & Young	4,200	2,000
Deloitte & Touche	3,900	1,900
Arthur Andersen	3,300	1,990
Coopers & Lybrand	3,000	1,250
Price Waterhouse	2,500	1,100

SOURCE: *Public Accounting Report*, March 15, 1990.

The "Big Six," as the largest firms, shown in Table 1, are sometimes called, are a result of mergers of the former "Big Eight" accounting firms that were dominant in the 1980s. In 1989, Ernst & Whinney merged with Arthur Young, while Deloitte, Haskins & Sells merged with Touche Ross.

In addition, there have been numerous mergers and acquisitions as firms restructure themselves to meet the demand created by globalization. Even modest-size companies now require advice in such fields as international tax law.

Coopers and Lybrand

Accounting, auditing, and bookkeeping firms have restructured themselves to meet the demand for services created by globalization. For example, even modest-sized companies now require advice in such fields as international tax law. Receipts in 1991 are expected to increase 12.7 percent over the 1990 level.

Many large accounting firms have expanded into management and administrative services, management consulting, economic research, and other consulting services. Firms that provide both accounting and consulting are deriving an increasing share of their revenue from the consulting side of the organization, partly because billing rates for consulting are approaching accounting rates.

Restructuring and diversification of individual firms in the 1980s has resulted in two areas of ethical concern in the industry: "lowballing" and "cross-selling." "Lowballing" is bidding for jobs at below-cost prices to build market share. "Cross-selling" occurs when a diversified accounting firm solicits management consulting work from an auditing client.

A Securities and Exchange Commission (SEC) "firewall" ruling on June 20, 1990 gave a major consulting firm more leeway to form joint ventures with audit clients on projects for third parties. The ruling said that such a joint venture could be a conflict of interest unless a firm's auditing and consulting arms are adequately separated. Following the SEC ruling, the American Institute of Certified Public Accountants (AICPA), the major professional body of U.S. accountants, reached a consent agreement with the SEC on August 3, 1990 that it will not intefere if its members wish to accept referral fees, contingent fees, or commissions from non-audit clients. This further softened the division between auditing and consulting. For example, an accountant could recommend that a client acquire a financial instrument, then accept a commission for the advice. The SEC and AICPA decisions may cause further restructuring as firms take advantage of "cross-selling" opportunities.

Demand will increase in 1991, resulting in higher receipts and employment. Receipts are expected to increase 12.7 percent to an estimated $42.3 billion. Employment is forecast to reach 560,000, or 3.7 percent above the 1990 level.

Advertising

The advertising industry consists of establishments that prepare advertising (written copy, art, graphics, audio, video, and other creative work) for clients, and place the finished product in periodicals, newspapers, and/or broadcast media on a commission or fee basis.

Receipts for advertising firms with payrolls reached an estimated $20 billion in 1990, an increase of about 5.1 percent from 1989. The industry had approximately 270,000 employees on the payroll in 1990, up 5.5 percent from the previous year. The *1987 Census of Service Industries* reported 17,199 firms engaged in this activity. The top ten advertising agencies in the world grossed anywhere from $585.5 million to $1.3 billion in 1989, as shown in Table 2.

The primary function of an advertising agency is to plan and create advertising campaigns. Planning consists of researching a target market for a given product or service, then finding the most effective way to sell to that market. The agency then creates the campaign and buys time and space in selected media. Contracts between agencies and clients may allow termination by either party on short notice, usually 90 days.

Trends and Forecasts: Accounting, Auditing and Bookkeeping Services (SIC 893)

(in millions of dollars except as noted)

Item	1987	1988	1989[1]	1990[1]	1991[2]	Percent Change 1988–89	1989–90	1990–91
Receipts (millions of $)	26,612	29,695	33,303	37,500	42,250	12.2	12.6	12.7
Employees on payroll (000)	462	498	520	540	560	4.4	3.9	3.7

[1] Estimate.
[2] Forecast.

SOURCE: U.S. Department of Commerce: International Trade Administration (ITA), Bureau of the Census, and Bureau of Labor Statistics (BLS). Estimates and forecasts by ITA.

Table 2: The Top Ten Advertising Agencies by Gross Income, 1989

(in millions of dollars)

	Firm	Worldwide	U.S.
1	Denisu	$1,316.4	$ 50.0*
2	Saatchi & Saatchi	890.0	395.2
3	Young & Rubicam	865.4	409.5
4	Backer Spielvogel Bates	759.8	310.7
5	McCann-Erickson	715.5	209.1
6	Ogilvy & Mather	699.7	305.1
7	BBDO	656.6	373.6
8	J. Walter Thompson	626.4	266.5
9	Lintas	593.3	224.9
10	Hakuhodo	585.5	25.0*

* *The Economist* estimates.

SOURCE: *Advertising Age*, March 26, 1990.

Only rarely will an agency represent all product lines for a major client; even a single-product company might use different agencies for various geographic areas or media forms. In the late 1980s, to encourage clients to give them more business, many "superagencies" began offering not only ad creation and placement and market research, but total campaign development and execution locally, nationally, pan-regionally or even globally. Many advertising agencies are, in fact, becoming marketing agencies.

Advertising agencies are organized in one of two ways. An agency may have groups of people to handle all the work for particular clients, with other groups handling other clients. All the groups use centralized facilities and have the benefit of a general planning board. Alternately, the agency may be completely departmentalized, with each department serving all clients. The account executive will use the copy department for copywriting on his accounts, the art department for layouts and illustrations, etc. Some agencies mix the group and departmental structures.

Agencies are compensated by fixed fees, media commission, or a combination of fees and commissions. Media billings reached $36.6 million in 1989, as shown in Table 3.

Demand for advertising services will increase in 1991, resulting in higher receipts and employment. Receipts for advertising services are expected to reach $21 billion, a 5 percent increase over 1990. Employment is forecast to increase 5.6 percent to 285,000 in 1991.

Executive Search

The executive search industry consists of companies which identify and recruit qualified candidates for executive level positions. They may assist either employers or people seeking employment.

Receipts for executive search firms reached an estimated $3.25 billion in 1990, an increase of about 12.1 percent from the previous year. The industry had approximately 30,000 on its payroll in 1990, of whom nearly half were professionals.

Table 3: U.S. Media Billings[1] by Category, 1989

Media	Billings in Millions of Dollars	Billings as Percent of Annual Total
Newspaper	$ 3,193.1	8.7
Consumer magazine	4,866.0	13.3
Sunday magazine	107.9	0.3
Business publication	924.6	2.5
Medical journal	435.9	1.2
Farm publication	61.3	0.2
Spot TV	7,769.1	21.2
Network TV	10,230.9	28.0
Cable TV	795.9	2.2
Syndicated TV	462.1	1.3
Radio	2,412.8	6.6
Outdoor	692.8	1.9
Other[2]	4,624.1	12.6
Total	36,576.5	

[1] Billings reported by 450 of the top 500 agencies.

[2] Includes free-standing inserts, transit ads, point-of-sale, direct response sales promotion, special events, and Yellow Pages.

SOURCE: *Advertising Age*, March 26, 1990.

Two types of firms operate in this sector. One type works on contingency, the other on retainer. In general, firms that work on contingency place executives in positions that pay $75-$100,000, or less, while firms that operate on retainer place executives in positions that pay in excess of $100,000. About half the work in this sector is done on contingency—fees are usually 25-30 percent of the first-year salary—and the contingency market is increasing.

More than 2,000 firms provide executive search services; more than 90 percent of these have 10 or fewer professionals. The top 10 executive search firms had worldwide billings of $555 million in 1989 (Table 4).

Table 4: Top Ten U.S. Executive Search Firms

(in millions of dollars)

	Firm	1989 Worldwide Billings*
1	Korn/Ferry International	$103.3
2	Russell Reynolds Association	87.0
3	Spencerstuart	75.0
4	Egon Zehnder International	73.0
5	Heidrick & Struggles	57.4
6	Ward Howell International	45.3
7	Nordeman Grimm	30.5
8	Boyden International	30.2
9	Paul Ray & Carre Orban	27.5
10	Norman Broadbent International	25.8

*Less expenses.

SOURCE: *Executive Recruiter News*, May 15, 1990.

Although most firms are small, a few large firms account for most of the revenue. In the retainer market, eight firms earn almost one-third of the revenues, megafirms clearly dominating. In the contingency market, four giant firms account for one-fifth of the business. More than half the firms are located on the East Coast, but California has more than any other single state. The first executive search

Trends and Forecasts: Advertising (SIC 731)

(in millions of dollars except as noted)

Item	1987	1988	1989[1]	1990[1]	1991[2]	Percent Change 1988-89	Percent Change 1989-90	Percent Change 1990-91
Receipts (millions of $)	16,803	18,340	19,023	20,000	21,000	3.7	5.1	5.0
Employees on payroll (000)	217	237	256	270	285	8.0	5.5	5.6

[1] Estimate.

[2] Forecast.

SOURCE: U.S. Department of Commerce: International Trade Administration (ITA), Bureau of the Census, and Bureau of Labor Statistics (BLS). Estimates and forecasts by ITA.

Trends and Forecasts: Executive Search Services

(in millions of dollars except as noted)

Item	1987	1988	1989[1]	1990[1]	1991[2]	Percent Change 1988-89	1989-90	1990-91
Receipts (millions of $)	2,200	2,500	2,900	3,250	3,650	16.0	12.1	12.3
Employment (000)	24	26	28	30	32	7.7	7.1	6.7

[1] Estimates by *Executive Recruiter News.*

[2] Forecast by U.S. Department of Commerce, International Trade Administration (ITA).

SOURCE: *Executive Recruiter News.*

firm was founded in 1926, but nearly 90 percent of today's firms were founded in the 1970s and 1980s.

"Executive temporaries" is the fastest growing segment of the burgeoning multi-billion-dollar temporary market (90 percent of all companies use temps). The effect on the executive search market is slight, but noticeable. There are more than 30 executive temporary firms in this $50-$75 million market, which handle as many as 200,000 exec temps. Exec temp agencies are selling time. Executive searches usually take 3 to 6 months; exec temp positions are filled in 5 to 15 days, for jobs typically lasting 3 to 9 months.

Demand for executive search services will grow in 1991, resulting in receipts increasing 12.3 percent, to $3.65 billion. Employment is forecast to reach 32,000, or 6.7 percent above the 1990 level.

Legal Services

The legal services industry consists of establishments headed by members of the bar and engaged in offering legal advice or legal services.

Receipts for legal services establishments with payrolls reached an estimated $91 billion in 1990, an increase of about 9.6 percent from 1989. Nine hundred forty thousand employees were on the payroll in 1990, up 4.9 percent. The *1987 Census of Service Industries* reported 138,222 establishments engaged in this activity.

Most lawyers are in general practice, but many specialize in such fields as corporate, real estate, tax, patent, and criminal law. Roughly two-thirds of all lawyers are employed in the legal services industry; the rest work for corporations, trade associations or government agencies.

Methods of providing legal services have changed substantially in the past decade. Legal clinics, group legal service plans, promotional practices, and new technologies have affected the nature of the profession.

Group legal service plans continue to be popular. Members of these plans may choose from a variety of services by lawyers (who may or may not work exclusively for the plan) at preset prices. There are also prepaid plans, which work much the same way as group health insurance. Participants' contributions are pooled to help defray the cost of service to individual members. Simple wills, uncontested divorces, and residential property transactions may require no additional fees; more costly services are provided at reduced rates. The largest group plans are run by employers, labor unions, credit unions and insurance companies.

Legal clinics and group plans have been affected by advertising. Price competition has increased since the rules governing legal advertising were relaxed; nearly 25 percent of lawyers now advertise in one form or another.

Changes in the national economy have an impact on the industry. Recessions create a greater demand for lawyers in such areas as corporate restructuring and company bankruptcy. Consumer legal expenditures tend to decline, but deep recessions drive up the demand for personal bankruptcy services. Periods of strong economic growth, on the other hand, result in greater spending for legal services for forming new businesses and for real estate transactions.

Legal activities pertaining to international trade and finance have intensified in recent years. Import-limiting measures, the growing number of suits challenging the "dumping" of foreign products on U.S. markets, and the increased complexity of laws governing international trade have all stimulated the demand for lawyers.

Corporations are developing innovative ways to lower legal costs while maintaining the same degree of service. They may use in-house counsel; take bids from several legal firms; consider alternative billing methods; request detailed budgets and itemized billing; invest in computers or hire a law firm that uses computers to create, store, retrieve, and transmit data; and/or use arbitration whenever possible to avoid litigation.

The legal profession is trying to lower costs by using more legal assistants, who function in much the same way as lawyers but concentrate on tasks that are time-consuming and detail-oriented.

Demand for legal services will increase in 1991. Receipts are expected to reach $100 billion, or 9.9 percent above the 1990 level. Employment is forecast to rise 4.8 percent, to 985,000. The top 10 legal services firms in the United States billed $2.9 billion in 1989 (Table 5).

Trends and Forecasts: Legal Services (SIC 81)

(in millions of dollars except as noted)

Item	1987	1988	1989[1]	1990[1]	1991[2]	Percent Change 1988-89	1989-90	1990-91
Receipts (millions of $)[3]	66,998	75,953	83,066	91,000	100,000	9.4	9.6	9.9
Employees on payroll (000)	805	852	896	940	985	5.2	4.9	4.8

[1] Estimate.

[2] Forecast.

[3] Estimates are obtained from a sample of employers only and therefore do not include nonemployer receipts.

SOURCE: U.S. Department of Commerce: International Trade Administration (ITA), Bureau of the Census, and Bureau of Labor Statistics (BLS). Estimates and forecasts by ITA.

Table 5: The Top 10 U.S. Legal Services Firms by Revenues, 1989

	Gross Revenues (in millions of dollars)	Size Lawyers/Partners
1 Skadden, Arps	517.5	948/197
2 Baker & McKenzie	341.5	1,339/432
3 Jones, Day	320.0	1,052/369
4 Shearman & Sterling	281.0	487/123
5 Gibson, Dunn & Crutcher	280.0	611/194
6 Davis Polk & Wardwell	240.5	380/96
7 Sullivan & Cromwell	230.0	345/95
8 Latham & Watkins	223.5	475/170
9 Cravath, Swaine & Moore	213.0	288/64
10 Fried, Frank	213.0	368/104

SOURCE: *The American Lawyer*, July/August 1990.

Coopers and Lybrand

Management consultants assist clients with strategy, information technology, and resource management. Growth in the management, consulting, and public relations services industry will continue in double digits.

Management, Consulting, and Public Relations Services

The management, consulting, and public relations services industry provides information and expertise. Services are provided for a fee, or by contract for a specific length of time or objective. There are five main service categories: management and administration (business and facilities management, and other administrative services); public relations (including lobbyists); management consulting (marketing, personnel, and administrative consulting); economic and sociological research; and other consulting services.

Receipts for management, consulting, and public relations establishments with payrolls reached an estimated $63 billion in 1990, an increase of 9.9 percent from 1989. The industry had a payroll of approximately 570,000, up 3.4 percent. It is staffed primarily by such professional and technical personnel as accountants, economists, industrial engineers, designers and public relations specialists. The *1987 Census of Service Industries* reported 65,623 establishments with payroll engaged in this activity.

The firms in this sector offer varying services and increasingly cross boundaries and invade each other's territory. Most firms are small, although the 100 largest firms account for 76 percent of the market. The top ten management consulting firms are the "Big Six" certified public accounting firms; two benefits-based conglomerates, which advise companies on retirement, life insurance, and other employee benefits; and two "classic" management consultants, which advise clients on operational and organizational issues.

Small firms, or even sole practitioners, can achieve success by identifying appropriate market niches. The major firms, employing hundreds or thousands of people, have international networks; links between practices in different countries can vary from partnerships to loose affiliations that do not involve profit sharing. Large firms service a diverse client base, including large transnational corporations.

The trend toward larger firms in this sector reflects a desire to provide more comprehensive services; and to ensure that adequate funds are available for training and personnel development, for introducing advanced information technology, and for developing new services. Growing competition between providers necessitates both cost-effectiveness and diversification.

Consulting firms are increasingly involved in systems integration, providing advice on equipment purchases, installation, software development, and education and training. The leading consulting firm in this area derives more than half of its revenues from this endeavor. Also, firms that once only manufactured computer equipment are entering this area, since it has exhibited considerably stronger performance than most equipment sectors. The top 10 U.S. management consulting firms had $7 billion in worldwide revenues in 1989 (Table 6).

Growth of management, consulting, and public relations services may continue in double digits. Receipts are expected to increase 10.3 percent to $69.5 billion in 1991. Employment in the industry is forecast to reach 590,000, or 3.5 percent above the 1990 level.—*J. Marc Chittum, Office of Service Industries, (202) 377-0345, August 1990.*

Trends and Forecasts: Management, Consulting, and Public Relations Services (SIC 7392)

(in millions of dollars except as noted)

Item	1987	1988	1989[1]	1990[1]	1991[2]	Percent Change 1988-89	1989-90	1990-91
Receipts (millions of $)	44,252	52,528	57,324	63,000	69,500	9.1	9.9	10.3
Employees on payroll (000)	561	538	551	570	590	2.4	3.4	3.5

[1] Estimate.
[2] Forecast.

SOURCE: U.S. Department of Commerce: International Trade Administration (ITA), Bureau of the Census, and Bureau of Labor Statistics (BLS). Estimates and forecasts by ITA.

Table 6: The 10 Largest U.S. Management Consulting Firms

		1989 Worldwide Consulting Revenue (in millions of dollars)	Percent Earned Overseas
1	Andersen Consulting	1,442	40
2	Ernst & Young	814[*]	42
3	Marsh & McLennan Cos	800	30
4	KPMG Peat Marwick	650	46
5	McKinsey	635	57
6	Towers Perrin	621	24
7	Coopers & Lybrand	536	48
8	Deloitte & Touche	526	33
9	Price Waterhouse	508	53
10	Booz-Allen Hamilton	453	19

[*] Includes expenses.

SOURCE: *Consultants News*, June 1990.

Additional References

(Call the Bureau of the Census at 301-763-4100 for information about how to order Census documents.)

American Association of Advertising Agencies, Inc., 666 Third Avenue, New York, NY 10017. Telephone: (212) 682-2500.

American Bar Association, 750 North Lake Shore Drive, Chicago, IL 60611. Telephone: (312) 998-5000.

American Institute of Certified Public Accountants, 1211 Avenue of the Americas, New York, NY 10036. Telephone: (212) 575-6200.

Census of Service Industries, Bureau of the Census, U.S. Department of Commerce, Washington, DC 20233. Telephone: (301) 763-1725.

Consultants News, Kennedy & Kennedy, Inc., Fitzwilliam, NH 03447. Telephone: (603) 585-6544.

Council of Consulting Organizations (includes ACME, Inc., and the Institute of Management Consultants), 230 Park Ave., New York, NY 10169. Telephone: (212) 697-9693.

Current Business Report: Service Annual Survey, Bureau of the Census, U.S. Department of Commerce, Washington, DC 20233. Telephone: (301) 763-1725.

Employment and Earnings, Bureau of Labor Statistics, U.S. Department of Labor, Washington, DC 20210. Telephone: (202) 523-1221.

Executive Recruiter News, Kennedy & Kennedy, Inc., Fitzwilliam, NH 03447. Telephone: (603) 585-6544.

Public Relations Society of America, 845 Third Ave., New York, NY 10022. Telephone: (212) 995-2230.

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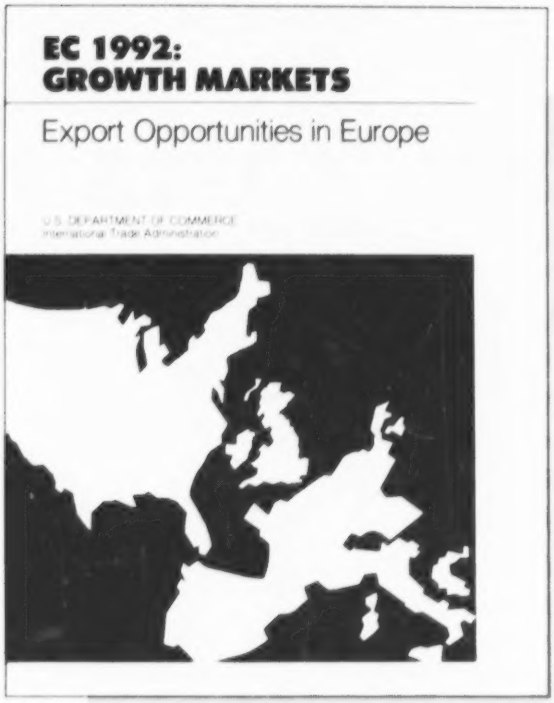

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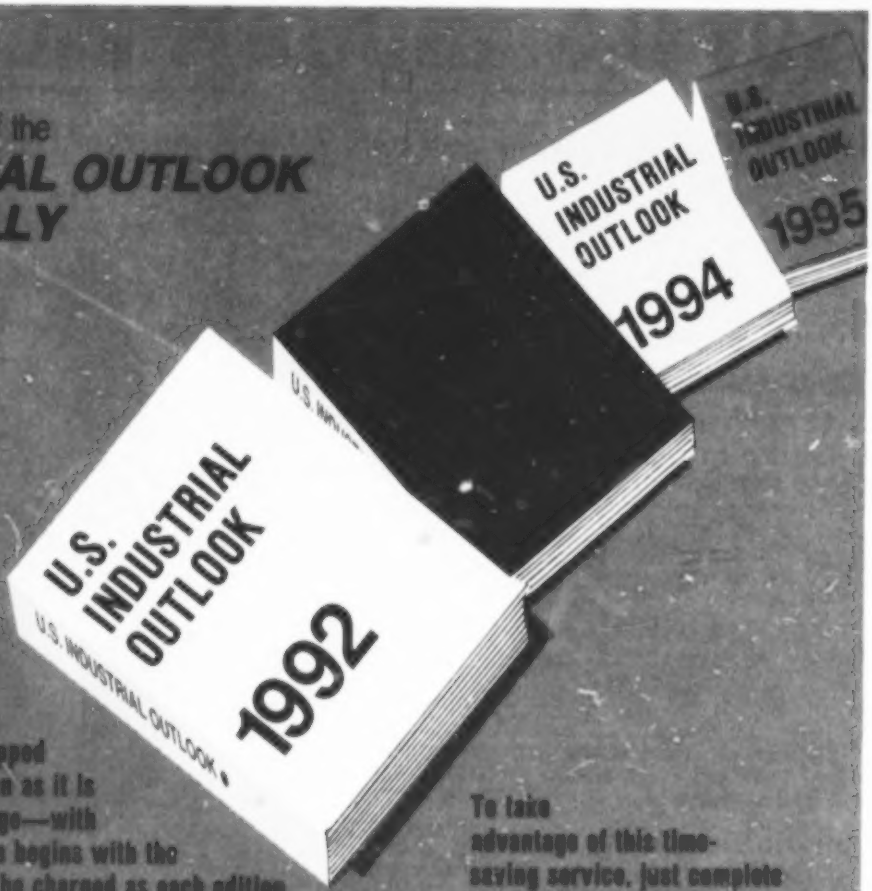
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